Vol. 91, No. 19 New York, May 12, 1928 *Pages 949-998*

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Electrical World

The consolidation of Electrical World, Electrical Engineer and American Electrician

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McGRAW-HILL PUBLISHING COMPANY, INC., Tenth Ave. at 36th St., NEW YORK, N. Y.

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NEW YORK District Office, 285 Madison Ave.
WASHINGTON, National Press Building
CHICAGO, 7 South Dearborn St.
PHILADELPHIA, 1600 Arch St.
CLEVELAND, Guardian Building
ST. LOUIS, Bell Telephone Building
SAN FRANCISCO, 883 Mission Street
LONDON, 6 Bouverie Street, London E. C. 4

Cable Address "Machinist, N. Y."

Publishers of
Engineering News-Record — American Machinist
Power — Chemical and Metallurgical Engineering
Coal Age — Engineering and Mining Journal
Electrical Merchandising
Ingeniería Internacional — Electric Railway Journal
Bus Transportation — Construction Methods
Electrical World — Radio Retailing
Electrical West
(Published in San Francisco)
American Machinist—European Edition
(Published in London)

Member Audit Bureau of Circulations
Member Associated Business Papers, Inc.
Circulation of this issue, 19,325

The annual subscription rate is $5 in the United States, Canada, Mexico, Alaska, Hawaii, Philippines, Porto Rico, Canal Zone, Honduras, Cuba, Nicaragua, Peru, Colombia, Bolivia, Dominican Republic, Panama, El Salvador, Argentina, Brazil, Spain, Uruguay, Costa Rica, Ecuador, Guatemala, Haiti and Paraguay. Extra postage to other countries $4 (total $9 or 38 shillings). Subscriptions may be sent to the New York office or to the London office. Single copies, postage prepaid to any part of the world, 25 cents.
Change of Address—When change of address is ordered the *new* and the *old* address must be given. Notice must be received at least ten days before the change takes place.

Copyright, 1928, by McGraw-Hill Publishing Company, Inc.

Published weekly

Entered as second-class matter Jan. 20, 1907, at the Post Office at New York, N. Y., under the Act of March 3, 1879.
Printed in U. S. A.

Advertising Index—Alphabetical, 92; Classified, 86, 88, 90; Directory of Engineers, 44, 45; Searchlight Section, 46-51

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Electrical World

McGraw-Hill Publishing Company, Inc.
JAMES H. MCGRAW, *President*

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Editor

VOLUME 91 — *New York, Saturday, May 12, 1928* — NUMBER 19

Social Values in Industrial Decentralization

THE day of the single large production plant in an industrial center has passed. Both economic and social values have forced industrial decentralization. In a sense this trend is a by-product of technical progress, for electric power and electric machines make decentralization possible. Power can be delivered to a factory at a cost which is about the same in any part of the country. This power has been so used in machines and control mechanisms that any kind of labor can readily operate an industry after a very short period of training. Efficiency in production has come to mean a comparatively small plant wherein a single competent production executive has full scope to exercise his talent by direct control and scrutiny of all operations. Marketing efficiency dictates the use of multiple-production plants in local market areas tied together by a national sales and manufacturing policy. All these economic values are recognized and are being put to work in American industry.

But the social values are of equal importance, as pointed out by George M. Verity in this issue. The trend toward decentralization makes for better working conditions and a more equitable distribution of wages to workers. A factory in a small town raises all standards of living. The farmer on the outskirts can diversify his farming and better his load factor; the worker can have his garden and can walk to work; the factory payroll increases the prosperity of the community, and thus all inhabitants get an increment increase in wealth and consequently an increment increase in standards of living. As Mr. Verity points out, industry has an obligation to the utilities to use their power, because this use makes possible the extension of electric service to farms and small communities. In the ultimate balance sheet the mechanization of civilization will give equal value to social and economic assets.

* * * *

"Professionalizing" Public Relations Activities

THIS is an age of extreme specialization and minute organization. The temptation to design complex mechanisms to attain results often within reach by simpler means is widely prevalent. It often assails those responsible for light and power company administration, for much of our modern thinking is based upon intricate systems of service. Little could be accomplished without proceeding from such a base, but mechanistic conceptions should not be followed slavishly. Public relations work, for example, is less a matter of machinery than of individual service and personal contact of employees and executives with customers and others. Good service at fair rates is basic, but, given this elementary requirement, the rest should follow without resorting to professionalized propaganda or building up a special organization to be the regular feature display of the company front window.

Organization for quiet, effective service within the company and the cultivation of friendly dealings with the public, yes; but no "ballyhooing" about "the fine department we have to build up good relations with customers" and no substitution of social welfare vernacular for simple business give and take. There should be no need of labeling the office doors of this department with anything but the names of those whose human understanding of their duties finds competent expression in their daily service in this important cause. Office machinery in its proper place, but in the long run the less the public thinks about the mechanism of corporate good will, the better. The ancient saying that Mark Hopkins on one end of a log and a student on the other created a university might well be paralleled by the statement that wherever a public utility employee and a customer meet on a plane of courtesy and fair intentions there is a public relations structure capable of being developed into an edifice of permanent worth and beauty.

* * * *

Resolutions Are Not Enough

FOR a number of years the Natural Resources Production Department of the Chamber of Commerce of the United States has at the annual meeting of the chamber discussed natural resources with particular reference to electric public utilities. This year's meeting, held in Washington, again took up the subject, particularizing on group management and electric power and the investor, while the chairman of the department, M. S. Sloan of Brooklyn, stressed the water-power situation and legislation. The Natural Resources Production Department is, apparently, working hard, and yet, in spite of the airing of these vital public questions, business remains outwardly apathetic. Of what use are resolutions unless they are put in practice?

For example, the Chamber of Commerce of the United States is committed to the principle that government should not enter the realm of business to undertake that which can be successfully performed in the public interest by private enterprise. This principle it holds to be politically and economically sound. Nevertheless, the judgment of this organization, representing the collective business enterprise of the country, is apparently not regarded as of much weight by those who make the laws and those who administer them. Otherwise we should not have constantly thrust before us attempts to put the government into the electrochemical business, the fertilizer business, the coal business, the power business, the transportation business, etc. Would it not be proper at this time, considering the bent of Congress toward such legislation, for American industry to assert itself more

vigorously on this question of government in business? We hold with the chamber that ruthless methods discredit all business and should not be tolerated. We believe that abuses should be checked and curbed in the public interest; but government ownership in any guise should not be sanctioned, however great the provocation. This, we feel sure, is the position of American business, and the Chamber of Commerce of the United States, without neglecting its other work, would render a great service to industry by arousing people to the danger which departure from this principle would bring upon the Republic and its institutions.

* * * *

Price Cutting— the Cause and Cure

MANY men have been wrecked by living beyond their incomes. Many men live successfully within their incomes. The amount of the income has very little to do with it. It is a matter of principle, a practical matter of policy with a man whether or not he shall discipline himself and his household to the point where expenses shall be held within the family resources. It is, after all, a simple matter to understand, however hard it is to live up to the precept.

For all that men may say, it is precisely the same principle that is involved in price cutting. The only difference is that in business the sources and possibilities of the income and the character and diversity of the expenses are highly organized and much more complicated. But the control still lies in that same simple element of courage that enables men to pocket pride and face embarrassment and alter plans and win the loyal co-operation and support of the others who may be affected. In family life it entails the sacrifice of pleasure and comforts. In business life it entails the sacrifice of volume, the curtailment of production and sometimes the reduction of the organization. Either is hard to do and usually should not be done if by effort and ingenuity overhead costs can be cut or the income can be increased. Price cutting is like running up unpaid bills. It saves face temporarily and feeds false hope, but if carried too far leads to disaster.

At the present time American industry is volume-mad and electrical manufacturers have been afflicted with the epidemic. To get volume of sales too many of them are cutting prices and sacrificing profits in a struggle to maintain a condition of overproduction by striving to snatch the order away from the other fellow and keep the factory operating at full capacity. The trouble is that in industry it does not stop there. For cut prices lower market levels and demoralize values because other sellers feel obliged to cut, and soon profitless prices become established and are temporarily unescapable. And yet some manufacturers refuse to scramble for orders this way. They don't cut prices. If they cannot get business on a basis economically sound, they let somebody else take it. They reckon the prestige of their product to be worth more than their natural pride of volume. When they face a period of buyers' market they recognize that the only cure is limited production and they shoulder their responsibility. They live within their income.

Price cutting is primarily the false fruit of a state of mind. The seller indulges in it to save volume. The buyer sees in it an opportunity to save money. And in the end both lose.

Astral Analysis by Atomic Emissions

IT IS known that the emission and absorption spectra of stars permit a chemical analysis of their constituents to be made. Not content with this knowledge, research workers have made recent advances in atomic physics and spectrum analysis that give promise of a knowledge of the physical conditions of the stars. Each star gives a continuous spectrum as well as absorption and emission line spectra, and these two facts are seized upon by research workers to find out whether these spectra come from solid, liquid or gaseous masses.

The method used in the application of atomic physics to the exploration of these stars consists in the correlation of the temperature and pressure of the fixed stars with definite excitation energies obtainable in laboratory experiments and, further, in the comparison of the spectra emitted in these laboratory experiments with those of the fixed stars. Results are not complete, but data are accumulating rapidly. These researches afford more proof of the basic nature of electricity and its importance as a research tool.

* * * *

The New-Old Idea in Industrial Lighting

IT WOULD be absurd to liken present practice in industrial lighting of the best types to that of twenty years ago, when the present illuminating engineering movement was fairly getting under way. But the pendulum swings in engineering practice as in other things, and at the present time we are at the beginning of a new swing which to a certain extent is back in the direction of the localized lighting so common in days past. This localized lighting, however, is so different from the old as hardly to be recognizable as having points of similarity. The old practice in factory lighting of hanging a lamp on a drop cord over each place where work was to be done, supplemented in some of the better factories with arc lamps to give a background of general lighting, has changed in the last twenty years to general lighting of high enough intensity to do away to a large extent with the necessity of localized lighting. The cheapness of light and the desirability of doing away with troublesome drop cords have been important factors in bringing about this change, as well as the increased productivity and cheerfulness and the avoidance of accidents that go with a system of adequate general lighting.

General lighting by uniformly spaced luminaires with spacings and mounting heights according to the commonly accepted rules of good practice is giving excellent results as compared with the old methods, but the intensity of illumination by the general lighting method must be sufficient to meet the most exacting requirements to be found anywhere in the entire area. Our knowledge of the lighting intensities necessary for the best and most rapid work has now progressed to a point where it becomes evident that for operations on dark materials, under some circumstances, intensities of 30 to 100 foot-candles are economically desirable and are being used instead of intensities of about one-tenth those values, which were previously considered very excellent general illumination.

The attention of designers is again naturally led to producing these relatively high intensities at the

points where such high intensities are needed without the expense of producing them over the entire working area. It may be cheaper and more satisfactory to produce a fairly uniform intensity of 10 foot-candles, for example, over an entire working space than to resort to the complications and inconvenience of providing luminaires for localized lighting to get 10 foot-candles at certain designated working points, with the general level at other places much lower. With the cost of artificial light as it is at present, the possible savings in operating and wiring costs by the latter method may easily be offset by the interference with production. With ten times as much illumination required at certain critical working points it is easy to see that the answer to the problem may be different as the cost of light becomes larger in proportion to the labor factor of the production cost.

Along with this trend to localized lighting has very properly come a more careful study of what lighting conditions produce the best vision in specific cases. Mass production operations are now carried on upon a scale that justifies much thought and attention being directed to just how to produce the best visibility for the worker at any given step in a process, rather than simply "smearing around the foot-candles" promiscuously and trusting to luck that the job will be really well lighted. Dr. Percy W. Cobb of Nela Park has repeatedly urged this from the laboratory scientist's point of view in Illuminating Engineering Society papers the past three years, and the practical importance of such studies of quality in industrial illumination was most strikingly brought out by the paper on "Quality Industrial Lighting," written by Arthur A. Brainerd and abstracted in the ELECTRICAL WORLD of February 4. In this paper, which won the McGraw award at the N.E.L.A. convention last year, various examples are given where the quality of illumination as to uniformity and shadows and the contrasts of the objects being worked upon with the background were very important factors and where increase of illumination intensities without looking to these factors would give disappointing results. From which it is apparent that, although illumination design methods have been remarkably simplified and standardized in the past few years, there is still plenty ahead for the advanced lighting expert to do in the way of helping the manufacturer to get the conditions which are best for visibility in various processes.

* * * *

An Uncompleted Job

IN A STATE that shall be nameless and in a year that does not matter an electric light and power company decided to build a hydro plant in a certain valley. It was a partly wooded, farming country and, being free from "hot-dog" stands and gasoline filling stations, was easy to look upon. The utility, being community-minded, designed a dam and power house that would be a creditable addition, if not an improvement, to the countryside. As is so often the custom, the highway, formerly at a lower level upstream, was diverted to cross the dam, and when the project was completed it brought many motorists to the property of the power company and its well-planned hydro-electric project. During the process of construction barracks were erected on either side of the valley directly adjacent to the dam, and since certain fine old oaks and pines stood in the way they were cut down. Natural sand pits were at hand, and great yellow gashes on the hillsides told of the removal of construction material. When the job was completed the barracks were torn down, and the engineers, by industrious figuring, announced a cost of $185 per kilowatt and congratulated one another upon the completion of so fine a job, economically done.

What was the cost of that station? Should it not have included the planting of small trees to take the place of those removed? Did it not properly require provision for the filling in of the cellars and foundation areas of the dismantled structures? Should the raw, telltale pits remain as mute evidence of an uncompleted task that a few hundred bushes would have soon brought to a conclusion? Less than one per cent increase in cost would have accomplished wonders in skilled hands. It is, assuredly, a passing day when thoughtless, unconscionably poor economics permit the establishment of a final cost which omits an adequate cleaning-up process. It is an unfortunate day for the utility that neglects a magnificent public relations opportunity that shrieks, not knocks, at its door.

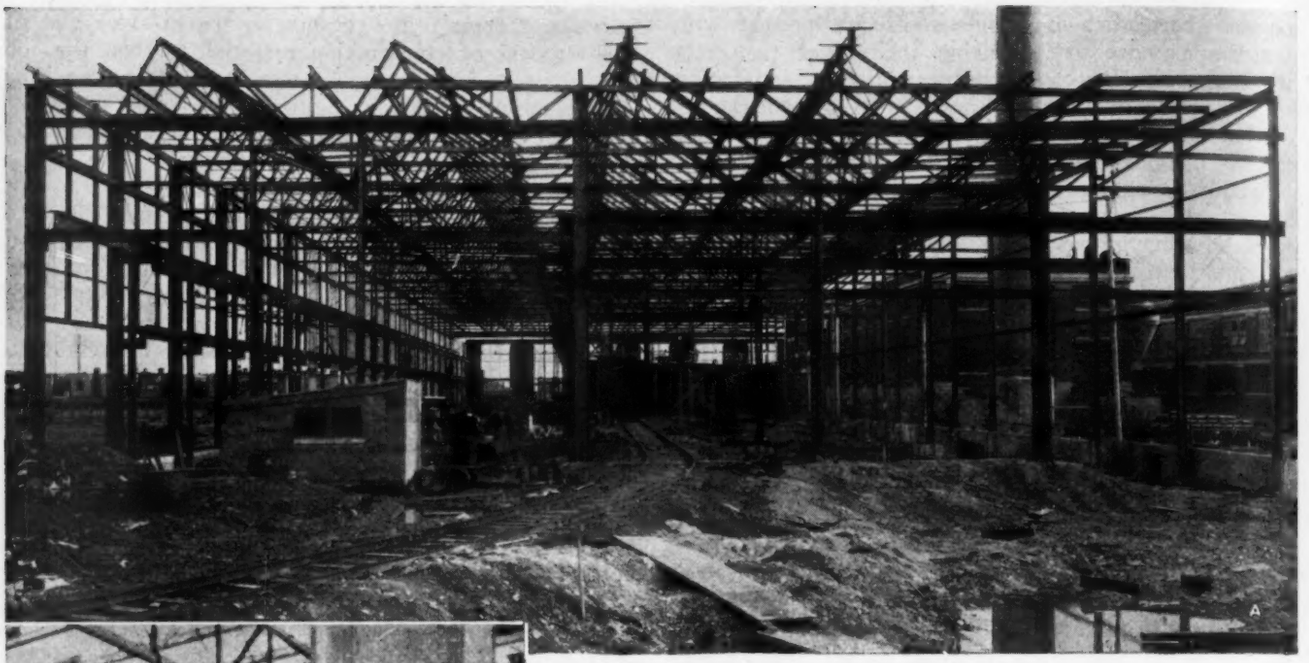
* * * *

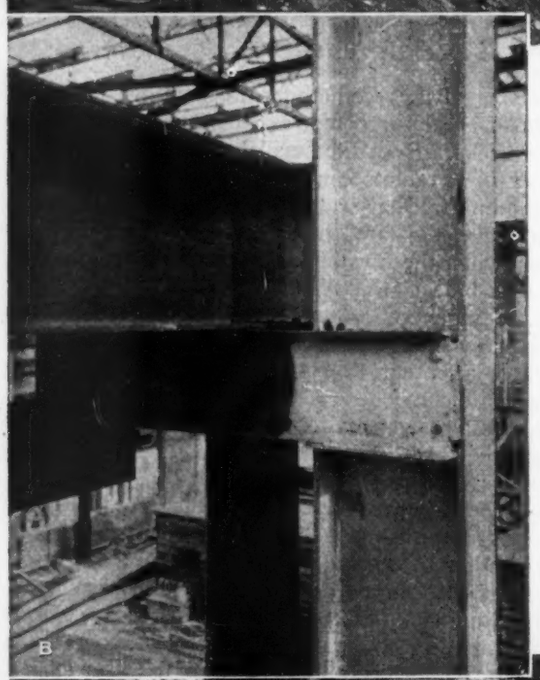
Modern Legerdemain

THERE is always something fascinating about the sleight-of-hand performer and his amazing series of impossible tricks. Even the small boy, however, realizes that twenty pink rabbits cannot be contained simultaneously in the one silk hat from which they are apparently drawn, and that the bowl of goldfish has not vanished into the air when the mystic passes have been completed over the soft blue cloth. Why are some power-station engineers so ingenuously credulous about their ability to cause equally tangible materials to disappear without trace? It is apparent that the goldfish and the non-oxidizable content of the coal burned in pulverized-fuel plants have both disappeared from view, and it is equally certain that they still exist somewhere.

A steam generating station utilizing 500 tons of coal a day with a conservatively estimated ash content of 6 per cent has 30 tons of solid material to dispose of properly whether a stoker-fed boiler or pulverized-fuel equipment is used. Some of it will inevitably reach the open air; with stoker-fed furnaces this is relatively limited. It is amazing to hear engineers who have lived and worked through the era that has minimized the smoke nuisance state that they do not know where the ashes go and that there is an almost negligible quantity of which to dispose. The ashes, as any one on the leeside of the plant and possibly many miles away can tell you, are floating gently down on the countryside. Ten or twenty tons of impalpables per day constitute an amazing contribution to the community, however clean and sootless this powder deposit may be.

Official data of test runs in one pulverized-fuel installation where special precautions have been taken to control ash deposits indicate that while an average of 3.68 per cent of the dry coal is reclaimed as slag from the combustion chamber, the total flue refuse per pound of dry coal burned amounted to 0.0994 pound. Slowly indeed has industry learned that refuse is not disposed of when acids and dyes are poured into previously attractive streams, that smoke pollution of the air is a civic offense, in addition to being unprofitable, and that valleys were not made for refuse pits. The past points the way. Ashes must be disposed of, not blown into the air and forgotten by all but one's neighbors.





Arc-Welded Building

A SAVING of 125 tons of steel was made possible by arc welding the frame instead of riveting. A total of 989 tons of steel was used, of which 745 tons passed through the welding shop of the American Bridge Company at Trenton, N. J. The building is being erected by the U. G. I. Contracting Company of Philadelphia for the General Electric Company at its new plant at Philadelphia.

A—View from rear of building. It is joined by a transept to the existing building seen on the right.

B—Details of crane runway brackets. Bolts were used in some cases to hold the frame in place before welding.

C—Welding a crane column to its base.

D—Method of connecting column to anchor bolts, utilizing steel angle welded to column.

Politics and the Colorado River

Scheme to inject federal government into power business disguised as safeguard against Imperial Valley floods

By H. I. HARRIMAN
President New England Power Company, Boston, Mass.

H. I. Harriman

UNDER the guise of a beneficent plan to protect the Imperial Valley of California against floods from the Colorado River by damming that stream at Boulder Canyon, developing hydro-electric power for transmission to the Los Angeles district and constructing a water supply from the Colorado Basin to serve a future population of 5,000,000 in southern California, it is proposed to launch the United States government into the power business at enormous cost and with all the uncertainties which beset vast political undertakings entered into without due regard to economic factors which should control action in such a situation.

A proper understanding of the problem of the Colorado River demands a brief explanation of the topography of its basin and the characteristics of its river flow. The Colorado Basin lies between the Continental Divide and the Coast Range. It includes southern Wyoming, parts of Utah and Colorado, the western half of New Mexico, substantially all of Arizona and slight areas in Nevada and California. Its area of more than 200,000 square miles is a territory larger than the German Empire and comprises about one-thirteenth of the entire area of the United States. It is a land of extreme variations in rainfall, in elevation and in the character of the country. The northerly part of the basin is highly mountainous and heavily timbered, a territory of warm summers and cold winters, a land of deep snowfall, a region that stores snows of winter and pours them forth in irresistible floods in the early summer.

The middle section of the Colorado Basin is a territory of low rainfall, six or seven inches; of high plateaus and of vast canyons. In no place in the world are there such deep, marvelously colored and wonderfully beautiful gorges and canyons.

The southern portion of the basin is a desert country, relatively low in elevation, with a rainfall varying from three to four inches, and of tremendous summer heat, 115 to 120 deg. being not unusual temperatures over much of this southern area in the months of June, July and August.

Irrigation is of tremendous importance in the arid West. The normal annual flow of the Colorado River is about 17,000,000 acre-feet, extreme years ranging from 9,000,000 to 25,000,000 acre-feet. Storage of water is vitally essential. The normal flow will irrigate about 5,000,000 acres, but in extremely dry years only half that area can be served. The Reclamation Service estimates that in the United States basin of the river about 7,000,000 acres could be irrigated if the water supply was sufficient. To this we must add about 1,000,000 acres in the delta region of Mexico. Already about 2,500,000 acres in the United States basin is irrigated, plus 200,000 in Mexico.

In 1921 representatives of the various states in the basin convened to draw a treaty which would definitely divide the waters of the river between the various states and permit the development of storage without fear that the states not benefited would be deprived of the future use of their just portion of the water.

The conference, while only partially successful, agreed that the four upper basin states should always so regulate their takings for irrigation that over a ten-year period an annual average of not less than 7,500,000 acre-feet should pass Lee's Ferry for use by the three lower basin states, and to this was added 1,000,000 acre-feet for the use of the lower basin states represented by the flow of the Gila River.

Unfortunately, the treaty did not attempt to divide the waters between the various states in the upper and lower basins, and so far Arizona has failed to ratify the treaty, fearing that without an agreement with California it would be unsafe for her (Arizona) to consent to a divi-

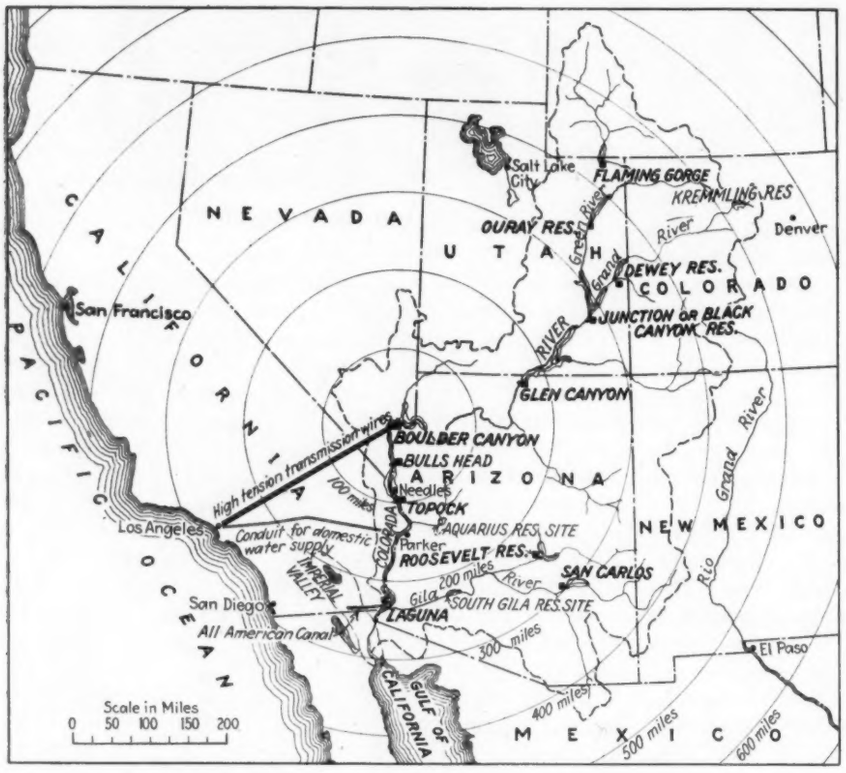
Sound Expert Advice

IMPRESSIVE because restrained and convincing because it offers a constructive program based on competent personal investigation on the ground, Mr. Harriman's analysis of the Boulder Dam project and the related political program for utilizing the Colorado River at the expense of the federal government deserves careful reading by every friend of individual initiative in the United States.

Mr. Harriman shows most effectively how protection against floods can be attained at a cost far below the anticipated outlay required to embark the federal government in the power business as a gigantic byproduct of an apparently innocent scheme to regulate and utilize stream flow in a basin occupying one-thirteenth of the area of the country.

sion of the waters between the upper and the lower basins unless simultaneously a treaty were enacted between California and Arizona giving Arizona protection against the immediate appropriation by the Sunset State of more than her share of the flowage into the lower basin states. California's ratification is conditional only and is to be made effective if the United States creates a huge storage reservoir on the lower river.

The upper basin states demand ratification without reservations. The cost of placing water in the Imperial Valley of California is probably not over half the cost of delivery to the high table lands of Arizona, and until



Colorado River basin center of political discussion

there is a division of the water to which the lower basin states are entitled Arizona will probably refuse to ratify the treaty. Both Arizona and the upper basin states fear that Mexico will put to prior use much of the water that otherwise might be used on United States land. Water is the lifeblood of these states and each state fears that Mexico or some other state will deprive it of a part of the water that it might otherwise use and doom a portion of its territory to perpetual desert.

In the canyon section of the river 6,000,000 hp. can be developed on a 60 per cent load factor. This exceeds the energy that can be developed on the St. Lawrence River or at Niagara Falls. Today there is little market for this potential power, as the territory is very sparsely settled with no industry and no local use. Only the lower section of the river lies within transmission distance of the large electrical market of southern California, but to any one who visualizes the phenomenal engineering and industrial progress of the last 50 years it is not difficult to imagine that the entire potential power of the stream may be used within the next half century.

The danger of a break of the river into the Imperial Valley is ever present and the homes of 60,000 people with a taxable value exceeding $100,000,000 will be in constant danger until the federal government takes adequate steps to open a new and proper channel for the sea. Storage on the main Colorado River would of course reduce the flood menace to this valley, but the threat of floods from the Gila will still exist and the valley will never be safe, storage or no storage, until a new and adequate channel is cut to the Gulf.

Competent engineers affirm that if the United States and Mexico execute a proper treaty a new channel can be cut at a cost not exceeding $5,000,000 substantially parallel to the original channel of the river, which will safely carry the floodwaters of the Colorado to the Gulf without menace to the Imperial Valley and without danger of undue silting.

We turn now to consider measures pending in Congress for the construction by the federal government of a huge storage dam near Boulder Canyon, the creation of a 1,000,000-hp. plant and the digging of an all-American canal to turn the waters of the river into the Imperial Valley through a channel lying in the United States alone.

The Reclamation Service estimates the total cost of the above projects at $125,000,000. Others have estimated the cost at double that amount, but whatever the cost, it will be by all odds the largest business adventure within the boundaries of the United States which the federal government has ever attempted.

The merits and demerits of this proposed all-American canal involve a long story which will not be entered into here. Suffice it to say that a Board of Government Engineers has reported the canal to be feasible at a cost of approximately $31,000,000, but it also suggested that if the canal were to be built and a larger area of land watered storage would be necessary against the low water season.

The search for storage aroused the interest of Los Angeles. The managers of the municipal electric system there had for some time been perturbed over the necessity of buying from a private corporation a major portion of the electricity that it sold to its customers. The citizens were not, however, prepared to vote a huge bond issue that would enable the city to develop its own hydro-electric system and the suggestion of storage on the Colorado for the benefit of the Imperial Valley seemed to open the possibilities of federal aid. Astute politicians combined forces and one step has led to another until the early plan to irrigate a few thousand acres of mesa lands above the Imperial Valley has developed into a project to secure federal construction of an irrigation, storage and hydro-electric development of enormous proportions. This project is claimed to be the only sound method of protecting the Imperial Valley against floods, which have twice swept into it and which now threaten its existence.

It is universally conceded that the federal government

should take adequate steps to protect the Imperial Valley from another disastrous flood. The valley is menaced, not primarily because of the size of the Colorado flood, but because the original stream bed of the river became clogged during the two years or thereabouts when it flowed into the valley. Recently American engineers, in consultation with Señor Mejorada, a distinguished Mexican engineer, have revived and improved the plan for an adequate channel protected by levees from the international border to the Gulf and they estimate its present cost at $5,000,000. If this plan is carried through the Imperial Valley will be adequately protected against all floods and a channel provided which will maintain itself by natural erosion and with little, if any, annual cost. It is a plan approved by Mexico and undoubtedly the United States government can secure the right for the construction and maintenance of this channel if proper representations are made at Mexico City. Yet we hear nothing of this project, though it is the least expensive and most adequate plan for protecting the Imperial Valley against floods.

This channel is needed whether or not storage is constructed on the main Colorado River, for the Gila River and other streams entering below the proposed site of the Boulder Canyon dam produce short floods of as great height, but of less duration, as those of the main river. The Boulder Canyon project would in no way protect the Imperial Valley from the Gila River floods.

The most available site for storage is probably the Mojave Canyon site below Needles, sometimes known as the Topock site, where a dam of moderate height will impound 10,000,000 acre-feet at a cost estimated between $10,000,000 and $15,000,000. This project was seriously recommended some year ago by Secretaries Weeks, Works and Wallace, who then comprised the Federal Power Board. It did not meet with favor in southern California because it did not include a great power development or an all-American canal.

Storage should, of course, be created in the upper stretches of the river above its rapid drop so that the flow may be regulated and conserved for all the potential power plants of the stream. In the upper basin there are two or three sites at which large storage can be created, and on the main river there are three additional sites. Of these last, at the upper site, Lee's Ferry, where 20,000,000 acre-feet can be stored and the river regulated to an even flow of about 15,000 second-feet, the most desirable location appears to exist for a great storage reservoir. This is at the head of the canyon section of the main river and would make possible the development of the entire stream for power. A second site is at Boulder Canyon, or Black Canyon, where a storage of equal size can be created, and finally there is the Topock site below Needles, in the Mojave Canyon, where a reservoir of any size up to 20,000,000 acre-feet can be created. A storage of 6,000,000 acre-feet is more than sufficient to prevent destructive floods on the lower river.

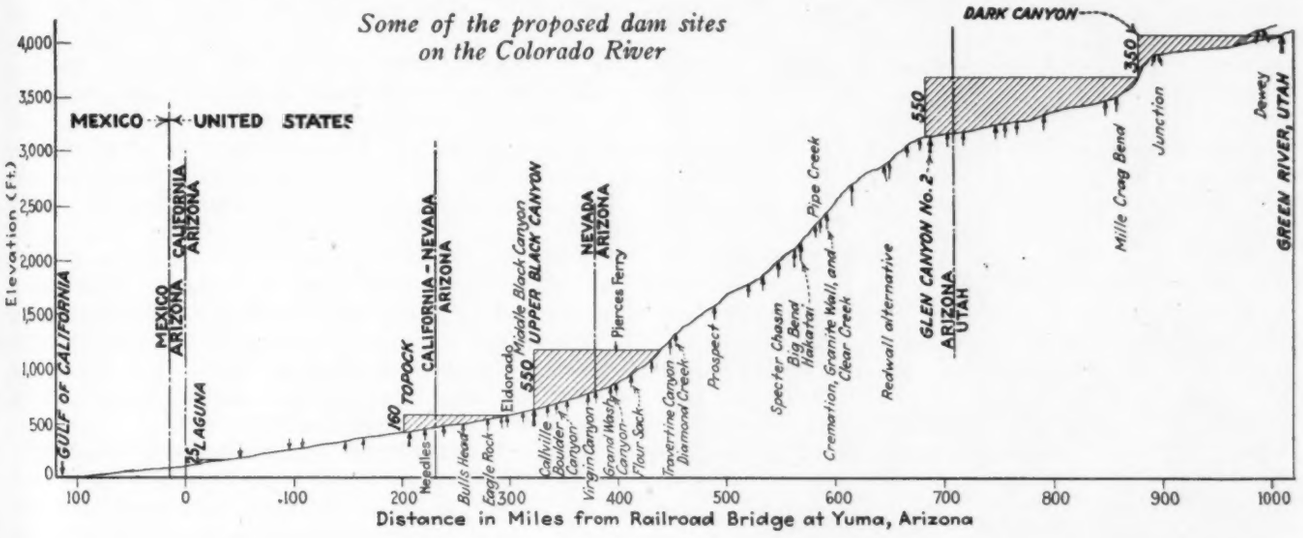
With the floods of the main river regulated by a reservoir at Lee's Ferry the construction problem of all the lower dam sites on the river will be greatly simplified. Preliminary borings indicate rock of a suitable character, but much further detailed study should be given to this site before any work is started.

A dam at Boulder or Black Canyon, near the foot of the rapid water of the Colorado River, is also probably feasible, although the bedrock is so far below the water level as to make the problem of building the foundation under a torrent rushing through a box canyon quite unprecedented and some engineers say all but impossible.

The storage capacity of Boulder Canyon will be of value in regulating the stream for any power plant located at that dam, or for further irrigation in the Imperial Valley and in Mexico, but it will have no value for the great power plants which will eventually utilize the main power of the river. At some time in the future storage must be created either at Lee's Ferry or in the upper basin to regulate the flow of the Colorado for the thirteen or fourteen power plants which will ultimately be built to utilize the fall in the Grand Canyon. When this upper storage is created the storage at Boulder Canyon will be unnecessary and the Boulder Dam will become a power dam without other function.

At the Topock site a storage of from 6,000,000 to 10,000,000 acre-feet can be created at a cost of from $10,000,000 to $15,000,000, or a storage up to 24,000,000 acre-feet at a corresponding additional cost. A 6,000,000 acre-foot storage will be of ample size to reduce the floods on the main river to a point that will in no way threaten Imperial Valley and substantially to increase the low water flow of the Colorado during the irrigation season, but no great amount of power can be developed at Topock. For this reason this project has not appealed

Some of the proposed dam sites on the Colorado River



to the managers of the municipal plant of Los Angeles, who desire to have the federal government supply them with electrical energy, or to the promoters in the Imperial Valley who wish to have the carrying charges of the all-American canal met from the sale of power.

The Boulder Canyon project is a power project pure and simple and is an effort to inject the federal government into the business of generating electricity. Boulder Canyon is not the proper location for a storage dam for the regulation of the main river. A river should be regulated at the head of its rapids and not at the foot. Again, the Boulder Dam is entirely unnecessary for the protection of or for irrigation in the Imperial Valley because both of these objects can be attained at a small fraction of the cost of the Boulder Dam by the construction of a dam at Topock.

Boulder Dam in Its True Light

Let us examine the Boulder project in its true light as a project to force the federal government into an investment of not less than $125,000,000 for the purpose of generating power for the cities of southern California and for the further purpose of building an all-American canal which the Imperial Valley cannot afford to carry.

If the project is carried out there will be developed at Boulder approximately 1,000,000 hp., or 750,000 kw., on a 55 per cent load factor. This means the annual production of about 3,500,000,000 kw.-hr.

The Federal Power Commission, which has carefully examined the market for Boulder energy, estimates that it will take southern California from nine to ten years to absorb this block of power after delivery is begun. It further estimates that the cost of Boulder power delivered at Los Angeles, including all transmission costs and losses, will be between 4¾ and 5 mills per kilowatt-hour. This is on the assumption that the Boulder project, including the all-American canal, will cost not exceeding $125,000,000. If the cost of the project should exceed that amount the cost of energy delivered in southern California would be increased proportionately.

Steam Power Costs Decreasing

The cost of power from Boulder Dam in fairness should be compared to the cost of power generated in a modern steam plant near Los Angeles. The Southern California Edison Company is now producing power, all charges included, in its Long Beach plant at slightly less than 4½ mills per kilowatt-hour. In its new and improved plant now under construction it is expected that the cost will be reduced to 3⅞ mills per kilowatt-hour, and in view of the remarkable strides that are being made in increasing the efficiency of steam plants it is not fanciful to imagine that the cost of steam power in southern California, with oil at its present price, will be approximately 3 mills at the time when the Boulder Dam project can be completed. Even if the oil supply of southern California is exhausted and it is necessary to turn to Utah coal, energy cost should not exceed 4 mills per kilowatt-hour. Thus the power users of southern California will be paying a mill a kilowatt more for Boulder energy, with the uncertainties of long-distance transmission, than for steam energy generated at their door. This will mean an annual loss of $3,500,000 and it may be twice that amount.

Boulder power at 4¾ mills is based upon the assumption that the dam itself can be built for $40,000,000, yet it must be recognized that the project is one of great hazard, that a dam 550 ft. high has never as yet been constructed, that it is necessary to go 127 ft. below the channel of the river in order to find bedrock and to excavate perhaps 20 or 30 ft. into this bedrock, thus making the total height of the dam from bedrock to crest nearly 700 ft., and that the work of clearing and preparing the foundations must be done in a stream less than 300 ft. wide and carrying each year floods of half the volume of the water which passes over Niagara Falls, and in some years a flow equal to the flow of Niagara. Competent engineeers have estimated the cost of the Boulder Dam at from $90,000,000 to $100,000,000 and some say that the project is almost impossible of accomplishment because of the unsurpassed difficulties in building such a huge dam in such a narrow gorge carrying such enormous floods.

It is urged that stored water from the Colorado River is necessary in order that Los Angeles and the other cities of southern California may have adequate domestic water supply. Los Angeles now gets its water supply from local sources and from the Owens River, and the best engineering evidence would indicate that this supply can be doubled before it is necessary to turn to the Colorado. Obviously the water of the Colorado should not be used by Los Angeles until every other source has been exhausted because of the great distance which it must be carried and the fact that it must be pumped over a ridge of the coast range 1,500 ft. high. When the population of Los Angeles reaches 5,000,000 it may be necessary for her to secure a part of her water supply from the Colorado, but even Western optimism must admit that such a contingency will not arise for several decades.

It is further urged that the Boulder project is required in order to protect the Imperial Valley from floods, yet we have seen that this protection can be supplied in other ways at a fraction of the cost.

Again, it is stated that Boulder power is required by southern California. While admitting the great growth of the power demand of the Sunset State, we have seen that its power requirements can be furnished at a very much lower cost from steam.

Finally, the need of additional stored water for irrigation is stressed. Such additional supply can be had at moderate cost from the Topock Dam, and further engineering study will reveal where the main storage of the Colorado should be located.

A Sane Program

What, then, is a sane program for the development of the Colorado River? The one pressing need is the protection of the Imperial Valley from floods. This protection can best be supplied by the construction of a suitable channel from the international border to the Gulf of California, and it is suggested that the first step should be the negotiation of a treaty with Mexico providing for the construction of such a channel.

As a second step the Topock Dam should be constructed both for flood protection and for irrigation. The construction of this dam requires no treaty with Mexico and work on it can be started at once.

The new channel and the Topock Dam can together be constructed at a cost of from $15,000,000 to $20,000,000 and together they will protect the Imperial Valley from floods and they will furnish it with such additional irrigation supply as may be required in the next decade.

With these two projects under way the Engineering Corps of the United States Army, assisted, possibly, by

other engineering departments of the government, should be given an adequate appropriation with which to make a complete study of the entire river. Such a study should include borings at all possible dam sites, complete surveys and a comprehensive plan which will most efficiently provide for the future development of power and irrigation. Such a program is sane, constructive and relatively inexpensive and will avoid costly mistakes and a wasteful use of one of the greatest resources of the far West.

System Frequency Control

By C. P. Hubbard
Chief System Operator Detroit Edison Company, Detroit, Mich.

FREQUENCY regulation of the Detroit Edison system is controlled by the largest power house under orders from the load dispatcher. The ratio of system capacity held in reserve for regulating purposes to capacity in actual use is about one to eight. That is to say, the amount of idle capacity floating on the line and available for regulation is approximately one-eighth of the total load. Each power house carries a definite percentage of the total system load. This figure is given by the load dispatcher each half hour, or, in case of sudden load changes, every fifteen minutes. If the regulating power house should be subjected to a sudden rise in load between normal load instructions the switchboard operator in the power house informs the load dispatcher and a new allocation of the total load is made. In a case of this kind the controlling power house continues to regulate at the rise in load until the new allocation is made by the load dispatcher.

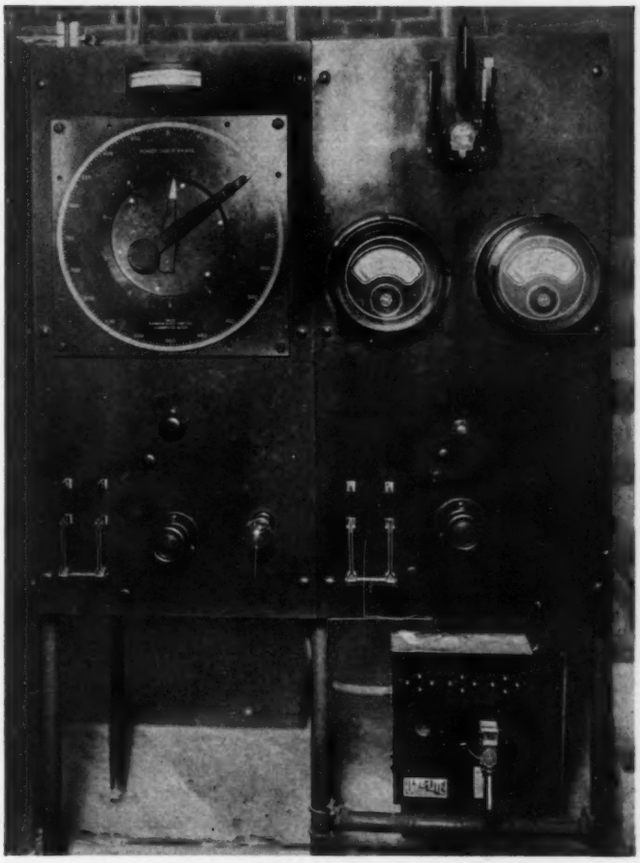
In order to restore system frequency to normal after emergency, such as switch trip-outs or loss of generators, the proportionate parts of the system load are put on reserve capacity, which is always available at all power houses. Reserve capacity is never allowed to get below a point at which the largest generator in the system might be lost and the frequency still maintained. Under certain emergency conditions the controlling power house relinquishes frequency control and it devolves upon one or more of the other power plants. Such an emergency would be a separation of the various system units by which a unit which may be in trouble is dropped out and the others continue to function as independent elements. In cases of extreme trouble a lower limit of 54 cycles has been set as the frequency at which a beginning should be made in dropping customers off the system in order to lighten the load.

In the control center, which is the system operator's office, a Westinghouse centrifugal recorder, type RF, is the master frequency control of the entire system. This meter gives a very accurate record of frequency variation on account of its sensitivity and the width and rate of travel of the chart. The company does not sell telechron or synchronous clocks to its customers, but these are used in the stations and power houses and on various types of demand meters on customers' premises. The master clock is corrected once each day by raising or lowering the system frequency very slightly. Adjustment is seldom necessary as the frequency is held practically constant. The Detroit Edison Company has at this time only one major interconnection, with the Consumers Power Company, made early in 1928. The Detroit company regulates the frequency of both systems.

Unique Bridge for Locating Cable Faults

By Charles H. Smith
Department of Standardizing and Testing Edison Electric Illuminating Company of Boston

THE Boston Edison Company has recently installed at its Edgar station a specially designed apparatus for locating cable faults by bridging. The outfit is composed principally of two main units, a very sensitive bridge with separately mounted galvanometer and an auxiliary motor-generator set for supplying direct current at 1,500 volts. For low-resistance faults a 125-volt direct-current source, provided with a series rheostat for current control, is used instead of the 1,500-volt source. The bridge and other parts of the equipment are insulated for 1,500 volts.

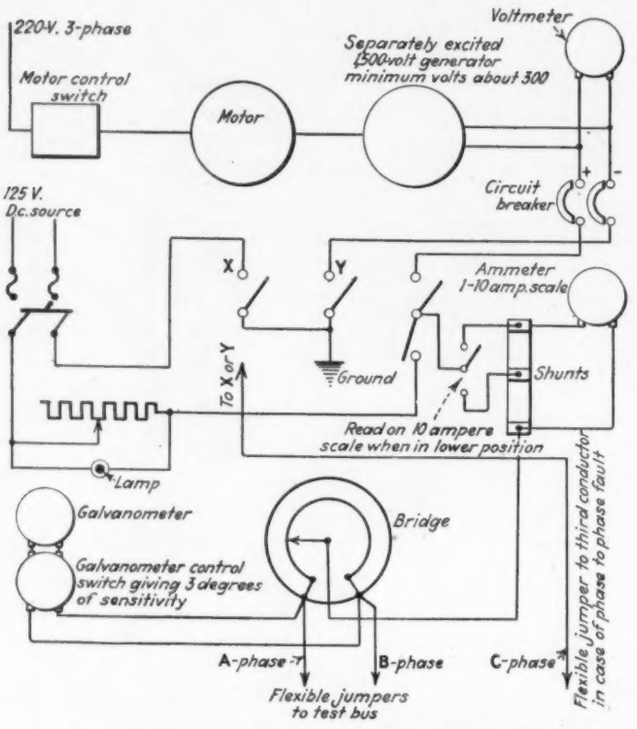


Panel-mounted bridge and accessories for locating cable faults

The bridge proper was furnished by the Rawson Electrical Instrument Company, Cambridge, Mass. It consists of a helically wound slide wire approximately 30 ft. long shrunk upon a bakelite drum. The operating lever makes ten complete revolutions as the slide moves from one end of the wire to the other, each revolution being indicated by a second arm geared to the operating lever. As the scale is divided into 1,000 divisions, each division represents one ten-thousandth of the cable length. As the length of the longest cable line from Edgar station is about 57,000 ft., each division represents not more than 11.5 ft. of cable.

In order to test the sensitivity of the bridge, a test was made on a line approximately 58,000 ft. long, with

an artificial fault introduced at 10,000 ft. With a solid fault and 2 amp. flowing through the bridge a galvanometer deflection of one division represented less than 1 ft. of cable. With a fault of 1,500 ohms and only 0.075 amp. flowing a deflection of one division represented 10 ft. of cable. Thus it can be seen that very accurate bridging is possible with this type of bridge.



Power bridge simplifies locating of cable faults

Its chief advantage over other bridges, however, lies in the fact that by the use of the 1,500-volt generator, even on very high resistance faults (i.e., faults of 100,000 ohms or more), the current can be brought into the range of the bridge. For example, at the time of the above tests, it was found that a fault as high as 500,000 ohms could be located within one cable section by the use of the 1,500-volt sources. This is a very great advantage when a joint blows open under water, resulting in a high-resistance water fault. Use of the bridge enables a troubleman to go to the approximate location and by inspection of a very few manholes locate the blown joint.

Another unusual feature in this installation lies in the fact that the connections are all made to the cable through a permanent test bus. The leads from the bridge terminals and from the ground, where one is needed as in the case of a phase-to-phase fault, are all rubber-insulated leads attached to long wooden operating rods. These have clamps which can be attached, from the floor below, to the bare test bus in the ceiling of the test room. Then by means of a gang-operated switch in the switch mechanism room the cable is connected to the test bus and when jumpers have been properly connected at the far end the cable is ready for bridging. At the Edgar station end it is not necessary for the operator to handle loose leads in the cable terminal room at all, which makes the operation of the test apparatus unusually safe.

The front view of the control panels shows the bridge dial on one panel and with it the galvanometer and low-voltage current control. On the other panel is the control equipment for the 1,500-volt motor-generator, with a double range ammeter (1 — 10 amp.) and a 1,500-volt voltmeter, both with protective cases. The bridge slider is inclosed in a dustproof case. The scheme of connections is shown in the accompanying diagram.

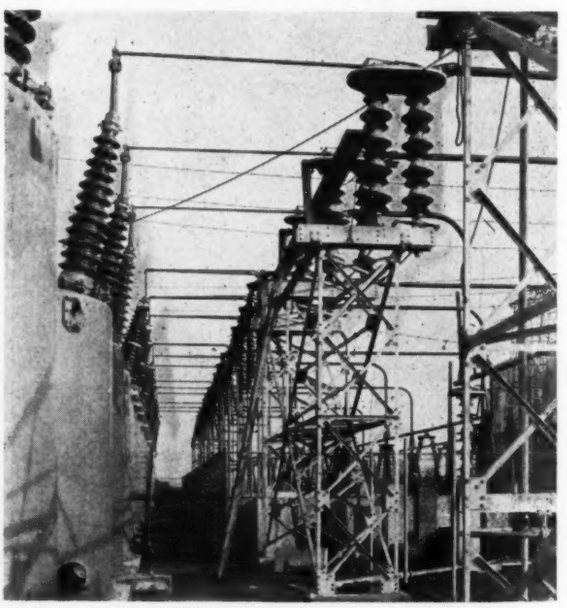
Performance of Coal Pulverizing Equipment

For Year Nov. 1, 1926, to Nov. 1, 1927

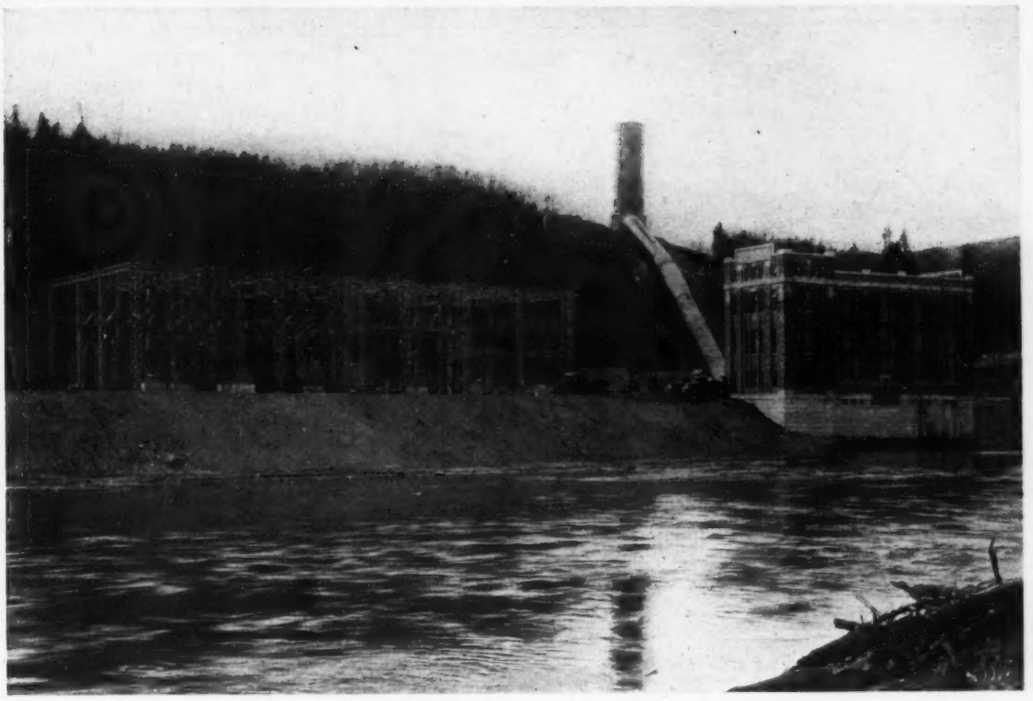
NEW ORLEANS PUBLIC SERVICE COMPANY, INC.

9-Ton Fuller Mills:	
Total coal pulverized, tons	92,620
Total hours operation, hours	12,840
Average coal pulverized per set of balls (4), tons	14,250
Average coal discharged per set of exhaust fan blades, tons	23,150
Average coal pulverized per set of pushers (4), tons	28,500
Average coal pulverized per spider, tons	30,870
Average coal pulverized per ball race, tons	46,310
2½-Ton Fuller Mills:	
Number of hours operation, hours	9,288
Coal pulverized, tons	17,500
Coal pulverized per set of balls (4), tons	14,000
Coal pulverized per set of pushers (4), tons	14,000
Aero Mills:	
Number of hours operation, hours	13,437
Coal pulverized, tons	32,450
Coal pulverized per set of paddles, tons	9,540
Coal pulverized per set of liners, tons	16,230

Disconnecting Switch Contacts on Breaker Terminals



OWING to space limitations adjacent to the oil circuit breakers on the 220-kv. lines that link the Laguna Bell substation with the Long Beach steam plant of the Southern California Edison Company the disconnecting switches are mounted directly on the oil circuit breakers, as shown in the accompanying illustration. Six three-pole manually operated switches are used at this substation. The circuit breaker bushing serves as the third insulator column of a single-pole switch and supports the jaw contact. The disconnecting switches are type TTR "Hi-Pressure" units manufactured by the Railway & Industrial Engineering Company, Greensburg, Pa.



Power from Pumped Water*

Water pumped to reservoir for later use in hydro plants. Rocky River development of the Connecticut Light & Power Company. River regulation controlled.

By E. J. AMBERG

Research Engineer Connecticut Light & Power Company

THE Rocky River hydro-electric development of the Connecticut Light & Power Company has created considerable interest among technical as well as non-technical men as a project for regulating the flow of the Housatonic River below New Milford, Conn. Briefly, the development consists of a storage reservoir created on Rocky River, a tributary of the Housatonic, with a power and pumping plant on the Housatonic River, the power and pumping plant being connected by a single penstock with the reservoir.

The Rocky River basin is located north of Danbury and west of the Housatonic River and the site of the development is approximately 1½ miles by state highway from the nearest railroad station at New Milford. The basin has a drainage area of approximately 40 square miles, 8⅓ miles of which is covered by the storage lake. The unusual features of this development lie in the fact that the drainage area of the reservoir basin will supply only about 1.5 billion cubic-feet of water in an average year, while the useful capacity of the reservoir is 5.9 billion cubic-feet. All water above the natural run-off required to fill the reservoir must be pumped from the Housatonic River against a head varying from 200 to 230 ft. While considerable excess hydro energy will be available for pumping, the studies and investigations for this development are all based on using secondary steam-generated electrical energy for pumping to be supplied over transmission lines from the Devon station of the Connecticut Light & Power Company.

**Abstract of paper presented at the regional meeting of the American Institute of Electrical Engineers, New Haven, Conn., May 11, 1928.*

Acts as a Battery

The Rocky River reservoir may be likened to a large storage battery. Charging the battery is accomplished by secondary steam energy driving two electrically operated 8,100-hp. centrifugal pumps, delivering water to the reservoir. The battery is discharged by means of the 30,000-kva. generating unit at Rocky River delivering primary hydro energy. The efficiency of this storage battery for changing secondary steam energy into primary hydro energy is 61 per cent; this includes all losses from the 66,000-volt bus at the Devon steam station

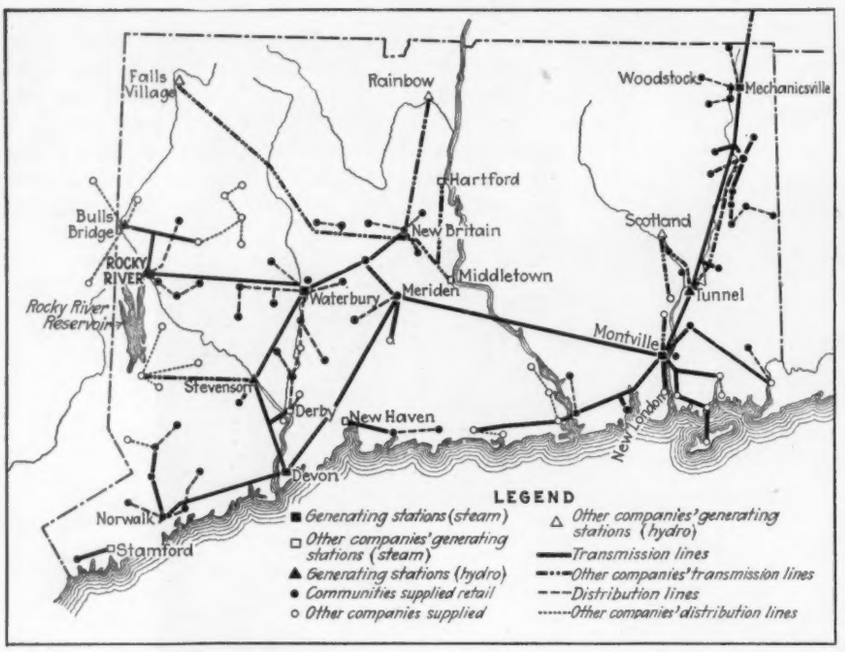


Fig. 1—Connecticut Light & Power system and Rocky River plant

through the pumping units into the reservoir and back through the generating unit to the 66,000-volt Rocky River bus. In other words, for every 100 kw.-hr. supplied by the Devon steam station in filling the reservoir 61 kw.-hr. is delivered by the Rocky River generating unit when the water is drawn out again. We must not, however, overlook the fact that below the Rocky River plant there is an additional total average head of 191 ft. available, of which 71 ft. is efficiently developed at Stevenson. If the head at Stevenson is added, then for every 100 kw.-hr. of steam energy 79 kw.-hr. of hydro energy is returned. If the total head from Rocky River to tidewater is added, 111 kw.-hr. of hydro energy could be obtained from every 100 kw.-hr. of steam energy used in pumping.

The Housatonic River had no means of regulation and the stream flow shows very wide variations. The only period of the year when any reliance can be placed on the river flow is in the spring. With the river plants at Stevenson and Bulls Bridge operated in conjunction with the Rocky River storage plant the 24-hour firm power of the hydro system is 11,000 kw. The chart (Fig. 3) shows the unregulated power duration curves for a typical dry, wet and average year, limited by the installed capacities of the Stevenson and Bulls Bridge stations, which together total 26,000 kw. The regulated 24-hour firm power of 11,000 kw. obtained by the addition of Rocky River is also shown. The respective areas between the 11,000 kw. regulated firm power and the power duration curves represent the energy which has to be furnished from storage. The amount required in each year varies considerably, being 9,500,000 kw.-hr. in the wet year and 39,900,000 kw.-hr. in the dry year. Of these amounts, 78 per cent is produced by the Rocky River station and the balance at Stevenson, generated from the water released from the Rocky River station. By applying the 24-hour firm power of 11,000 kw. to the upper half of the load curve, as shown in Fig. 4, curve 1, the total installed hydro capacity of 50,000 kw. can be used as firm capacity. Before regulation by Rocky River the combined firm capacity of the Stevenson and Bulls Bridge stations was only 10,000 kw., although the installed capacity was 26,000 kw. Therefore, by installing a 24,000-kw. generating unit in the Rocky River station and by regulating the river the firm hydro capacity has been increased by 40,000 kw.

To obtain the maximum benefits from such a storage development it is necessary to apply it to that part of the load requiring the smallest number of kilowatt-hours. When plotting system loads in the form of an annual duration load curve we will find that there is a decided peak. The reasons for this pronounced peak on the duration load curves vary; on systems like the Connecticut company, where there are no short time peaks of any extent, the seasonal changes in load are responsible. What appears as a very short time peak on the duration load

To the left are the concrete intake tower, the surge tank and penstock to power house below.

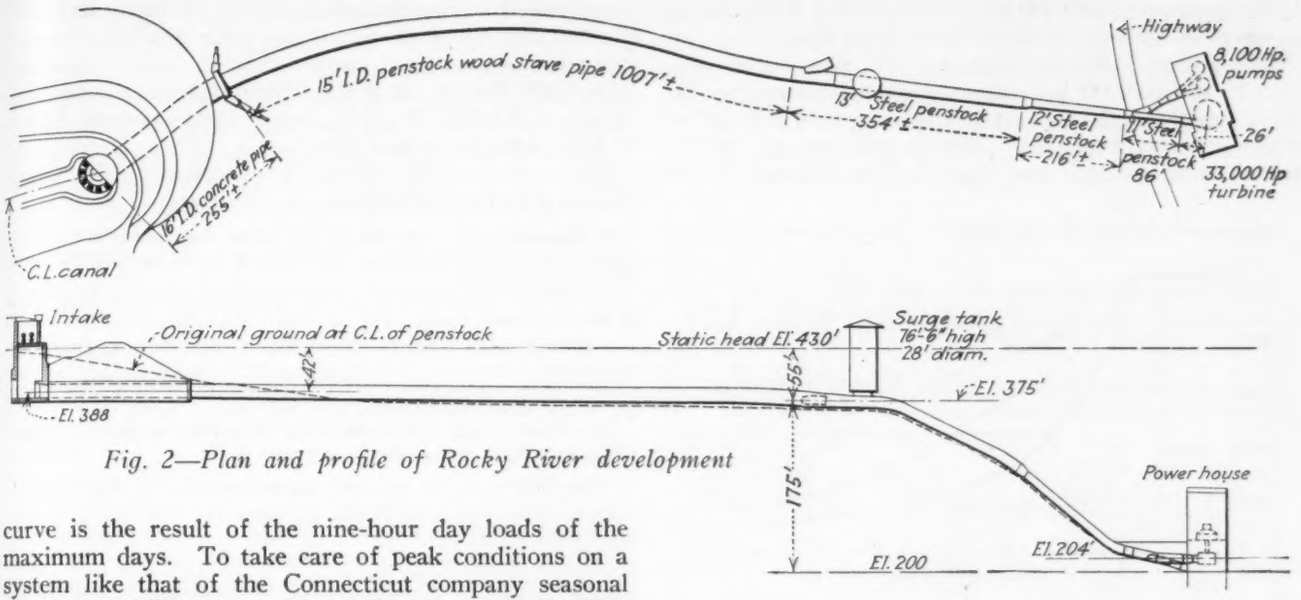


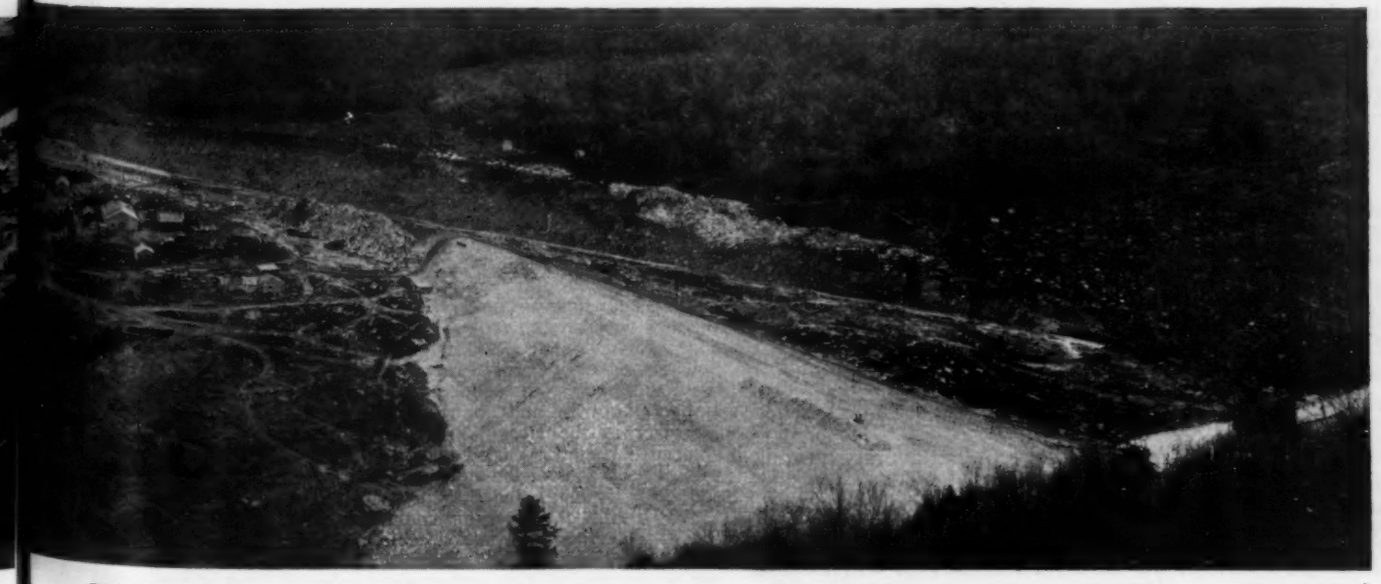
Fig. 2—Plan and profile of Rocky River development

curve is the result of the nine-hour day loads of the maximum days. To take care of peak conditions on a system like that of the Connecticut company seasonal storage in addition to weekly pondage is required. This seasonal storage is being provided by the construction of the Rocky River storage reservoir.

Two annual duration load curves are shown in Fig. 4; curve 1 represents the present approximate combined load of the Connecticut Light & Power Company and associated companies, while curve 2 shows the expected combined load for the year 1931. The upper half of load curve 1, and load curve 2 for that matter, contains only 18.2 per cent of the total kilowatt-hours; the load factor of this part of the load is 17.2 per cent. The advantage of applying the hydro generating capacity to the peak of the load and the steam generating capacity to the base of the load is quite evident from a study of this load curve. Assuming that the total load has increased 50 per cent, as indicated by curve 2 on Fig. 4, the same number of hydro kilowatt-hours represented by area *A2* would permit a firm hydro capacity of 65,000 kw., as against 50,000 kw. firm capacity of curve 1, or 15,000 kw. firm capacity could be installed without increasing the storage facilities. Additional capacity can often be installed at a low cost per kilowatt in existing plants, thus lowering the average unit cost per kilowatt of hydro capacity. Such storage development as Rocky River has, therefore, some inherent values which can be increasingly realized as the load increases.

Aside from the features discussed above, hydro plants have another great advantage in that they provide standby capacity which can be made available in a fraction of the time required at a steam station, because to get up steam and warm up a turbine requires time unless boilers are kept in service and excess turbine capacity is kept on the line to take care of sudden load demands. With the means of regulating the stream flow below Rocky River, it will be possible to develop the full head on this section of the river, which will then produce a total 24-hour firm power of approximately 23,000 kw.

The hydro capacity will again be applied to the upper half of the load curve, which from curve 1 on Fig. 4 shows a load factor of 17.2 per cent. In order to take care of possible changes in the load curve we will make an arbitrary increase in the load factor of one-third, which will change this load factor to 23 per cent. With a 23 per cent load factor and a 24-hour firm power of 23,000 kw. it will be possible to increase the total installed



This dam diverts water into canal running to left and thence to intake tower

hydro capacity to 100,000 kw. by developing the full head of the river between tidewater and Rocky River.

The second 24,000-kw. unit at Rocky River is in addition to the 100,000 kw. capacity above referred to; its main function will be to act as a spare unit, which can be made instantly available. The second unit can be installed at a low unit cost, including the raising of the

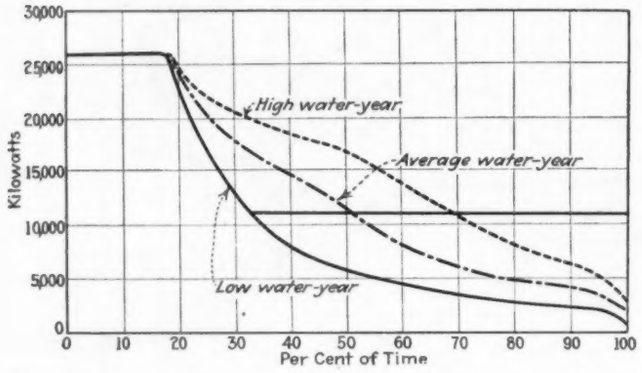


Fig. 3—Power duration curves for combined output of Bulls Bridge and Stevenson

The horizontal line on the chart represents Rocky River firm power

UNREGULATED

	Square Miles	Head, Ft.	Kw. Per Sq. Ft.	Installed Capacity Kw.
Bulls Bridge	782	104	6.27	7,200
Stevenson	1,510	71	4.40	18,700
				26,000
Rocky River	35	214.2		24,000
Power			15.55	
Pumping			25.35	

REGULATED BY ROCKY RIVER TO PRODUCE 11,000 KW. FIRM POWER

	Low Water, Kw.-Hr.	High Water, Kw.-Hr.	Average Water, Kw.-Hr.
Rocky River output	31,100,000	7,400,000	17,400,000
*Stevenson	8,800,000	2,100,000	4,900,000
Total	39,900,000	9,500,000	22,300,000

*Generated at Stevenson on water from Rocky River.

reservoir level, which will add approximately 1,000,000,000 cu.ft. to the useful storage capacity.

From the foregoing it can be seen that the Rocky River development has a considerable increased future value, by making it possible to develop the full head below Rocky River as the load of the system of the Connecticut Light & Power Company and associated companies increases. Without Rocky River further economic development of the river would have been impossible.

Use of Water Illustrated

In concluding the first part of this paper an account of water utilization at Rocky River and Stevenson stations for a typical average year seems in order.

As stated before, with a full reservoir the water level will be at an elevation of 430 ft. The normal allowable draw-down is 30 ft., or to water level elevation at 400 ft. In this 30 ft. of draw-down, 5.9 billion cubic feet of water is taken from the reservoir. This amount of water in going through the Rocky River generator will produce 24,200,000 kw.-hr.

From the power-duration curve for an average year in Fig. 3 it will be seen that 22,300,000 kw.-hr. must be generated by water from Rocky River to maintain the 24-hour firm power of 11,000 kw. Of the total of 22,300,000 kw.-hr. the Rocky River station will furnish 17,400,000 kw.-hr., while the remaining 4,900,000 kw.-hr. is generated at the Stevenson station by the water discharged from Rocky River station. The amount of water that must be taken from the reservoir in order to produce 17,400,000 kw.-hr. at Rocky River station is approximately 4,030,000,000 cu.ft., based on an average figure of 15.55 kw. per second-foot.

The water used for refilling the reservoir falls into two classes, with two subdivisions in each class:

1. Run-off water from the Rocky River drainage area:
(a) Water held back at a time when it would have spilled over the Stevenson dam.
(b) Water held back at a time when it could have been used at the Stevenson station.

2. Water taken from the Housatonic River and pumped into the reservoir:
(a) Water taken from the Housatonic River at a time when this water would have spilled over the dam at Stevenson.
(b) Water taken from the river at a time when this water could have been used at the Stevenson station.

The following is a brief summary of the amount of water obtained from each subdivision for an average year:

1. The run-off from the Rocky River drainage area in an average year based on a net area of 35 square miles is 1.6 billion cubic-feet.

(a) The daily discharge records for the average year show that there are 58 days of the year when the flow of the river equals or exceeds 2.86 cu.ft. per second per square mile, the flow necessary to produce 24-hour full load at Stevenson. The run-off during the 58 days amounts to 0.84 billion cubic feet. This amount of water, when finally released from the reservoir, will utilize the additional head at Rocky River as well as at Stevenson.

(b) The difference, or $1.6 - 0.84 = 0.76$ billion cubic-feet, is Rocky River run-off that is caught in the reservoir at a time when the river flow was less than 2.86 cu.ft. per second per square mile. This amount of water, when finally released, will utilize the additional head of the Rocky River station only.

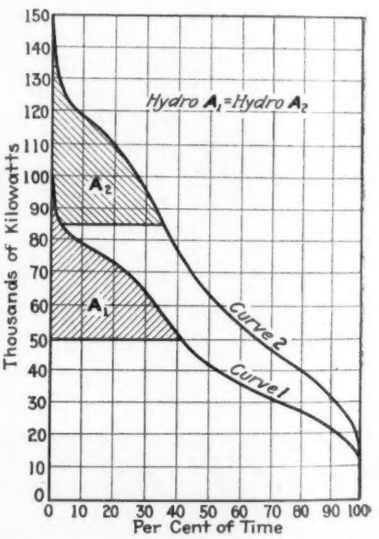


Fig. 4—Present and 1931 Rocky River load duration curves

	Curve 1	Curve 2
Maximum hours, kilowatts	100,000	150,000
Load factor, per cent	47.3	47.3
Hydro, kilowatts	50,000	65,000
Increase	.....	15,000
Hydro load factor, per cent	17.2	13.2

2. The total amount of water to be pumped in an average year is $4.03 - 1.6 = 2.43$ billion cubic-feet. The possible number of pump hours per week with two pumping units available is 336 hours. Load conditions, however, will normally limit the actual pump hours per week to 200 hours, which corresponds to an average pumping rate of 298 cu.ft. per second, as against the maximum possible rate of 500 cu.ft. per second, which is the capacity of the two pumps.

(a) The daily discharge records for the average year show that there are 58 days of the year when the flow of the river equals or exceeds 2.86 cu.ft. per second per square mile, the flow necessary to produce 24-hour full load at Stevenson, and 45 days when the river flow equals or exceeds 3.16 cu.ft. per second per square mile, the flow necessary to produce 24-hour full load at Stevenson after an average of 298 cu.ft. of water per second has been taken from the river at the Rocky River station. The amount of water pumped during this period is 1.32 billion cubic feet. This water when released from the reservoir will utilize the additional head at the Rocky River and Stevenson stations.

(b) To fill the reservoir completely an additional amount of $2.430 - 1.325 = 1.105$ billion cubic-feet of water must be pumped at a time when the river flow is less than 2.86 cu.ft. per second per square mile. This water when released from the reservoir will utilize the additional head of the Rocky River station only.

The storage reservoir or lake is about 10 miles long and 1¾ miles across at the widest part. It has a surface area of 8⅓ square miles and a shore line of approximately 60 miles. The main dam is located across Rocky River at a point about 1 mile above its junction with the Housatonic River. It is an earth-filled dam with a core wall. The lower part of this core wall consists of a 2-ft. concrete section which extends on the average 10 ft. above and an average of 5 ft. below the ground surface. On top of this concrete section was placed a 6-in. Wakefield core wall (timber) reaching up to an elevation of 435 ft. On the west end the concrete core wall was located in solid rock. This rock, however, dropped off rapidly below the surface at the location of the old river bed; from this point the core wall continued in earth. The material for the dam was obtained from the canal excavation and was placed in the dam by sluicing. The relative elevations were such that only a very small quantity could be sluiced directly, so practically all of the material was excavated with drag lines and placed in large piles. It was then sluiced from these piles down into the dam. However, after the dam had reached a certain height the slope in the sluicing line became insufficient; this was partly due, too, to the increased distance of the drag line from the dam. When this point was reached the material was sluiced to a pumping plant located at an elevation of 375 ft. Before being delivered to the pumps, the material was passed through a revolving screen which eliminated all stone over 6 in. in diameter.

On this dam itself a gasoline-driven drag line was utilized to throw up small dikes on each edge to hold the water within the dam and give the sluiced material a chance to settle. Near the center of the dam was a concrete chimney with openings which acted as overflows for the sluicing water. The chimney connected at the bottom with the concrete conduit under the dam. As the dam came up the openings were closed. The dike along the canal was constructed in a similar manner, as it constitutes practically an extension of the main dam.

The canal leading from the reservoir to the intake was excavated for about 3,300 ft. along the east bank of the valley. Terminating the dike in the side hill permitted

TABLE I—TABULATION SHOWING SUMMARY OF WATER USED FOR FILLING THE ROCKY RIVER RESERVOIR IN AN AVERAGE YEAR

Classification	Water	Amount of Water, Billions of Cu.Ft.	Will Use "Additional" Head of Rocky River Station	Will Use "Additional" Head of Stevenson Station
1 (a)	Run-off exceeding full load flow.	0.840	Yes	Yes
1 (b)	Run-off below full load flow.....	0.760	Yes	No
2 (a)	Pumped water exceeding full load flow.....	1.325	Yes	Yes
2 (b)	Pumped water below full load flow.....	1.105	Yes	No
	Total.....	4.030		

the construction of a circular intake tower in the canal with only a short length of concrete conduit extending through the dike. Six equal intake openings are located in the half of the tower facing the canal. Each opening is protected by vertical trash racks provided with a compressed air rack raking device, and each opening can be closed by steel stop logs operated by means of manually operated hoists. A self-closing sliding Broome gate is located at the entrance to the concrete conduit in the tower and operated by electric hoist. Ample air vents to the penstock are provided in the intake structure back of the gate. Necessary by-pass pipe connections are provided to fill the penstock from the intake with the Broome gate closed and for filling the intake from the canal with the steel stop logs in position.

The concrete conduit, having an inside diameter of 16 ft., extends only a short distance from the intake tower to the wood-stave pipe line. This wood pipe line

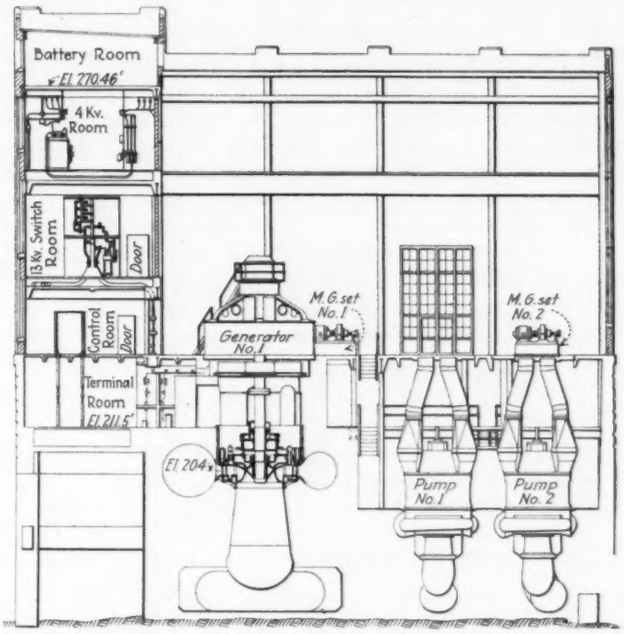


Fig. 5—Cross-section of Rocky River plant

has an inside diameter of 15 ft. and extends for approximately 1,007 ft. along the hillside. The average gradient is 0.5 ft. in 100 ft. The intake tower and wood pipe line are of sufficient capacity for the installation in the future of a second generating unit. The wood pipe line joins a steel penstock "Y" connection; one of the two branches is blanked off ready for a second penstock for the future unit, while the other extends a short distance to a Johnson differential surge tank. Freezing of the water in this surge tank is prevented by agitation with compressed air. From the surge tank the penstock drops down the hillside to the power house. The inside diameter varies from 13 ft. to 11 ft. just outside the power house, where there is another "Y" connection, one branch for the generating unit and the other for the two pumping units. Each branch has a Venturi section for measurement of flows.

Power Station Building

Like most modern power house construction, the substructure of the Rocky River plant is built exclusively of concrete, with a small amount of steel work to support the lighter floors. The foundation rests on bedrock, which was so close to the elevation desired that little rock had to be taken out or extra concrete put in. The concrete barrel type of construction was used, wherein the entire weight of generator, shaft, runner and hydraulic thrust is carried through a concrete barrel and the turbine speed ring to the foundations. The south end of the building, referred to as the switch bay, is supported on reinforced concrete columns. All the surface of the concrete substructure was coated with a waterproofing compound.

The power house superstructure is of structural steel framework and brick. Precast gypsum slabs provide the

foundation for an asphalt built-up roof. All exterior trim of the foundation is of precast cement blocks.

There are four floors in the switch bay with a control cable terminal room below the first floor. The first floor is the control room with the switchboard. The second floor contains the 13,200-volt pump motor bus and switching and the third and fourth floors are used for the 4,600-volt distribution bus and storage battery room.

Hydraulic Equipment

The hydraulic equipment of the power station consists of one 33,300-hp. vertical shaft turbine and two 8,100-hp. vertical shaft centrifugal pumps. A noteworthy feature of the turbine is the cylinder gate, which replaces the more conventional butterfly or Johnson valves for directly shutting off the flow of water to the turbine. This cylinder gate is built in the turbine in the annular chamber between the pit liner and the speed ring. It is operated from a valve on the generator floor, which controls the admission of water under penstock pressure to the annular chambers above the valve. Positive mechanical locking devices hold the valve either in a completely open or fully closed position.

The centrifugal pump specifications called for a rating of 112,500 gal. per minute (250 cu.ft. per second) delivered against a maximum head of 240 ft. In the discharge line of each pump is a hydraulic-cylinder-operated Dow pivot valve. The intake to each pumping unit can be shut off by a self-closing Treadwell gate, and each intake is equipped with vertical trash racks with air-raking device. Provision is made for the insertion of stop logs in each pump intake and in the two openings of the turbine draft tube.

The generator is of the standard vertical waterwheel type with shaft and exciter. It is rated at 30,000 kva., 80 per cent power factor, 13,900 volts, three phase, 60 cycle, 200 revolutions per minute, with direct-connected exciter rated at 154 kw., 250 volts, compound wound with interpoles. The pump prime movers are vertical synchronous motors rated at 7,900 kva., 80 per cent leading power factor, 13,200 volts (with voltage range of 5 per cent above or below), three phase, 60 cycle, 327 revolutions per minute. Pump motor and spare excitation is furnished by two motor-generator sets, each consisting of 150-kw., 1,200-r.p.m., 250-volt, compound-wound direct-current generator with interpoles direct connected to a 225-hp., 220-volt, three-phase, 60-cycle, squirrel-cage induction motor.

The shaft of the generating unit is of two sections, one for generator and one for turbine, with forged half-flanged sections bolted together upon installation. The turbine shaft has one guide bearing of the babbitted type mounted on the turbine crown plate. Lubrication is provided from a self-contained gear pump driven from the main shaft. For emergency operation a float-controlled rotary, direct-current motor-driven auxiliary oil pump is provided. The generator shaft has a Kingsbury thrust bearing with copper cooling coils and an upper and lower guide bearing of the babbitted type. The lubricating system for the generator shaft bearings consists of a gear pump, driven from the main shaft and located in the lower guide bearing oil pan.

The shaft of the pumping units is one-piece forged steel with a Kingsbury and combined upper guide and thrust bearing with copper cooling coils mounted on the upper spider designed to support the total weight and thrust and a guide bearing between motor and pump, supported in a cast-iron frame of heavy section bolted at the bottom to the upper head of the pump. Lubrication of all bearings on each unit is automatic from a motor-driven gear pump, with a similar pump for spare for each unit.

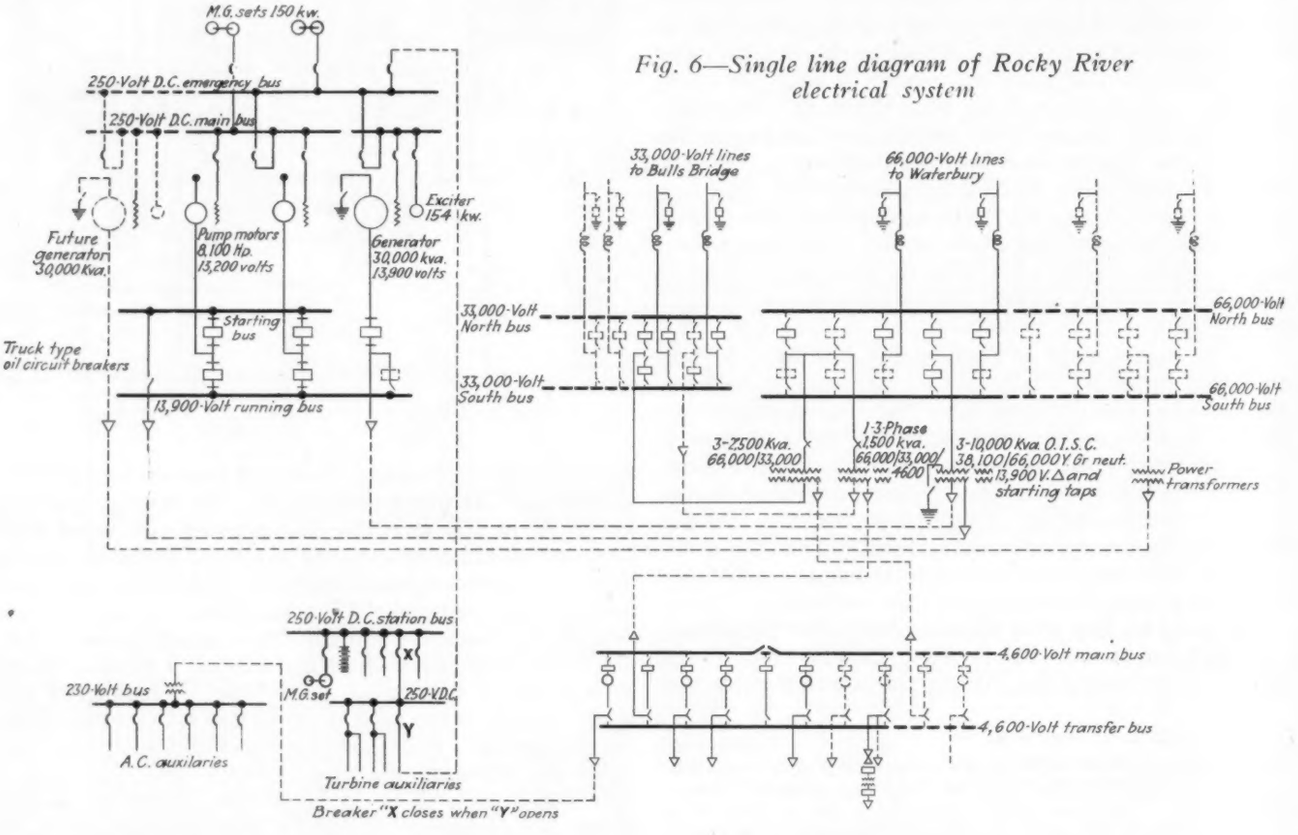


Fig. 6—Single line diagram of Rocky River electrical system

In the plant there are five distinct groups of electrical equipments:

(a) A 4,600-volt indoor local distribution bus.

(b) A 33,000-volt outdoor tie-in bus for Bulls Bridge station.

(c) A 66,000-volt outdoor main station bus.

(d) A 13,900-volt indoor bus for pumps.

(e) Station service buses.

The 4,600-volt bus is for distribution of power to the New Milford district. The 33,000-volt outdoor bus afforded the most economical arrangement for connecting the Bulls Bridge station (upstream from Rocky River about 8 miles) to the 66,000-volt main transmission system. The 66,000-volt outdoor substation consists of a main and a transfer bus with switching equipment for the two 66,000-volt, three-phase lines to Waterbury, the 30,000-kva. transformer bank stepping down to 13,900 volts and the connection to the transformer banks stepping down to 33,000 volts and 4,600 volts respectively. Space was left in the bus structure so that each of these two banks can be equipped with a separate circuit breaker. The 30,000-kva. main transformer bank has two oil circuit breakers, one of which acts as a transfer breaker. Although the generating voltage is 13,900, the main station voltage is 66,000. If it were not for the two pumping units there would be no bus and no switching equipment at 13,900 volts. The 66,000-volt side of the 30,000-kva. transformer bank is "Y" connected and solidly grounded. The 13,900-volt windings are provided with 40, 50 and 60 per cent taps to obtain with an open delta connection approximately half voltage for starting the pumps.

The 13,900-volt indoor substation is for the sole purpose of supplying power to the pumping units. There are two buses, a full-voltage running bus and a half-voltage starting bus. The connections from the transformer bank to the buses are made with single-conductor cables. The generator leads are connected to the running bus through a set of disconnecting switches, with provision for a future oil circuit breaker. On the generator side of this tap is a non-automatic oil circuit breaker to disconnect the generator from the transformer bank before it is used to supply power to the pumps from the 66,000-volt bus. The two oil circuit breakers connecting each pumping unit to the starting and running buses are interlocked.

Station Service Buses

A 230-volt, 60-cycle, three-phase bus supplies power primarily to the two motor-generator sets, the battery charging set, the sump pumps, air compressor, station lighting, etc. The main 250-volt, direct-current or exciter bus is at present divided into two sections, one for the generator, the other for the two pumps. The 250-volt direct-current emergency bus is supplied from one of the two motor-generator sets. The governor oil pump and the emergency turbine oil pump are normally connected to this bus; if power fails they are automatically switched over onto the 250-volt direct-current battery bus. All the control circuits and small direct-current motors in the plant are connected to the battery bus. The control battery was purchased large enough so that it can perform the double function of control battery and storage battery.

The Rocky River development was designed and built by the U.G.I. Contracting Company of Philadelphia for the Connecticut Light & Power Company in close collaboration with the latter's engineering staff.

Pin-Type Insulator Capacitance Tests

By Arthur L. Albert
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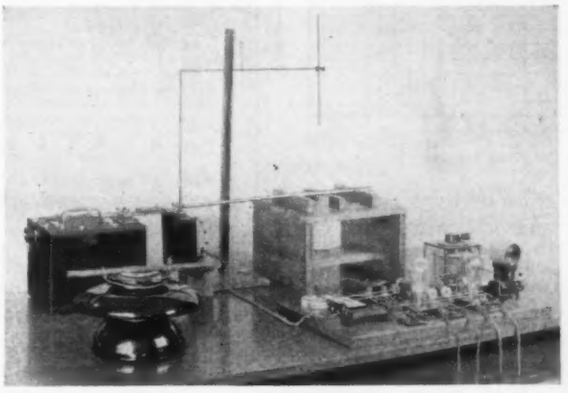
STUDIES of the capacitance phenomena in suspension-type insulator strings have been of importance in power transmission and it is possible that a knowledge of the capacitance of pin-type insulators may also prove useful to electrical engineers. Very little information is available regarding this subject, and with a view to determining the relations between the capacitance and other test characteristics of pin-type insulators an investigation was undertaken at Oregon State College.

The capacitance of 180 insulators was measured and test values were correlated with certain other insulator test characteristics. A wave-meter and a vacuum tube oscillator as shown in the accompanying illustration were used to make the measurements. The capacitance values were obtained by holding the oscillator frequency constant and observing the difference between the wave-meter condenser settings necessary to produce resonance both with and without the insulator in parallel with this condenser. Capacitances were found to vary from about 8 to 15 micro-mfd. at 500,000 cycles. Large variations in frequency, however, did not materially affect the capacitance. Various factors, such as the size of tie wire, were found to influence results. Also it was found that a relation exists between the capacitance of an insulator and its other test characteristics, particularly the puncture voltage value. This, no doubt, is due to the fact that the puncture voltage and the capacitance are both largely determined by the thickness of the porcelain between the pin and the tie wire and conductor. It is not believed that capacitance is the determining factor in the puncture voltage value at low frequencies.



Apparatus for measuring capacitance of pin-type insulators using a wave meter and oscillator

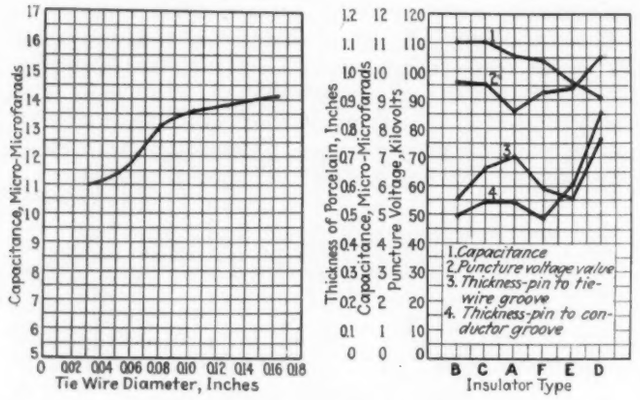
Tests were made on insulators submitted by six dif-

AVERAGE CAPACITANCE, MICRO-MICROFARADS, FOR TEN PIN-TYPE INSULATORS OF SIX MANUFACTURERS

Manufacturer	13-17 Kv.	45-55 Kv.	66 Kv.
A	10.54	13.12	12.31
B	11.08	12.00	12.82
C	11.05	11.71	14.14
D	9.10	10.88	11.97
E	9.65	10.60	11.73
F	10.38	11.08	10.91

ferent manufacturers and will be referred to as A, B, C, D, E and F. These were of three general classes, 13-17 kv., 45-55 kv. and 66 kv. Ten insulators of each class were measured, making a total of 180 tests in all. Individual values of capacitance obtained for the different voltage classes varied between 8.4 and 14.5 m.mfd. For the 13-17 kv. class the range was 8.4-11.8 m.mfd.; 45-55 kv. class, 10.0-14.4 m.mfd., and for the 66-kv. class, 10.6-14.5 m.mfd. Average values for ten insulators in each class are given in the table which appears on page 965.

Tests were made on an "A" insulator of the 13-17-kv. class to determine the influence of tie wire size on measured capacitance. Results are shown in an accompanying



Effect of tie wire size on insulator capacitance and other characteristics of 13-17-kv. pin-type insulators

illustration. While tests were made on only one insulator, it is evident that the size of tie wire very materially affects the capacitance.

The exact nature of dielectric losses due to an alternating field is not definitely known, and there is at present considerable research being conducted in this field. If there is an appreciable loss in insulators due to the alternating dielectric flux, this loss would probably vary with the capacitance. It was, therefore, thought possible that a relation would exist between the puncture voltage value and the capacitance, since the alternating dielectric flux would heat the porcelain and lower the dielectric strength. The values given in one of the accompanying curves, which were determined by test, show that as the capacitance decreases the puncture voltage value increases. This was what was expected from a consideration of the losses due to the dielectric flux. However, a study of the dimensions showed conclusively that the puncture voltage value at 60 cycles was not determined by the capacitance, but by the thickness of porcelain between the pin and the other electrode. A study was also made to determine the possible relation between the capacitance and corona formation voltage. No consistent relation was found to exist.

Conclusions Reached

High-voltage pin-type insulators have an appreciable capacitance, varying from about 8 to 15 m.mfd., depending on the design and voltage class of the insulator. An increase in the diameter of the tie wire increases the insulator capacitance.

Frequency of the voltage used in making measurements does not materially affect the measured capacitance.

There seems to be no consistent relation between capacitance and corona formation voltage.

Thickness of the porcelain between the pin or thimble as one electrode and the tie wire and conductor as the other is a very important factor in determining both the capacitance and the puncture voltage value.

The author wishes to acknowledge the assistance of Prof. F. O. McMillan and students of Oregon State College in making this investigation.

Submarine Cable Approach Tunnel

By M. R. Sumner
General Superintendent of Construction
Byllesby Engineering & Management Corporation, Pittsburgh, Pa.

During 1927 the Duquesne Light Company installed six cables under the Ohio River at Pittsburgh, Pa. These cables extend from the generating plant on Brunot Island, across the back channel of the river, under the main line of the Pittsburgh & Lake Erie Railroad, to a manhole on West Carson Street, a distance of 1,285 ft. The six cables are each 350,000 circ.mil, 22 kv., lead covered and steel armored. Dredging across the back channel was done by the Equitable Towing & Transportation Company, a subsidiary of the Duquesne Light Company. A trench about 6 ft. deep was dredged in the river bed, the cables were laid in, inspected by a company diver and the trench backfilled by the dredge boat to complete the installation work.

On the mainland it was necessary to tunnel under the four main line tracks of the Pittsburgh & Lake Erie Railroad. A 42-in. outside diameter steel pipe was used for driving the tunnel. This pipe, in 4-ft. sections, had a 6-in. x ¼-in. collar on the inside of one end. The first section also had a collar on the outside of the front end, which acted as a driving edge. The pipe was driven

Cradle and driving frame for steel pipe tunneling

through the earth by two 35-ton hydraulic jacks, pressing against an 18-in. driving frame of 6-in. x 6-in. oak, bolted together with staggered joints. A wooden cradle was set to line and grade to start the pipe in the right direction, which was checked twice daily with a transit as the work progressed. Driving was done continuously by three shifts of men and progressed about 1 ft. per hour. The cost of this tunnel was $235.20. Within the tunnel pipe were laid eight 6-in. sewer pipes as a duct line for the cables.

Are Customer Sales Overdone?

This might be the interpretation placed upon the recent drastic decline in the percentage borne by this type of financing to the total

By H. M. CAMERON
Financial Editor ELECTRICAL WORLD

ATTENTION has been directed recently to an apparent decline in the sale of preferred stock direct to customers by power and light companies through what are popularly called customer campaigns. Total sales of such issues in 1927 fell off to 11 per cent of the year's total financing, against an average of 19 per cent for the seven-year period 1920 to 1926 inclusive. The question arises as to whether or not customer ownership has been overdone. Have the companies been satisfied with the results of campaigns already carried on?

There has been, in fact, no falling off in actual totals of customer-ownership sales, although the proportion has declined materially. The 1927 total was slightly above the revised 1926 total of $236,557,100, although considerably under the 1925 total, which is the highest on record. The 1925 figure was 23 per cent of the total financing for that year. The decline in percentages since that time is due to two factors: A slight reduction in the aggregate volume of customer sales and a sharp increase in senior financing due to declining money rates and to other factors. Public sales of mortgage bonds were more than $1,107,000,000 last year, against $813,860,000 the year before, and the total of debentures sold rose from $158,250,000 to $358,150,000. It is significant that much of this financing was for the purpose of revamping financial structures and retiring high-interest bearing securities, since such financing is better adapted to the purpose than other types. Furthermore, the well-balanced company structures of the industry as a whole permitted of large-scale additions to funded debt, and at the attractive money rates ruling the volume of senior financing naturally increased rapidly.

So much has been said and written on the theoretical advantages to public utilities of selling stock direct to customers that an attempt to secure first-hand evidence with regard to results actually achieved seemed warranted. A questionnaire was sent to representative companies in different parts of the country and several of the replies are presented herewith. The questions asked were:

1. To what extent has customer ownership really proved beneficial in improving public and political relations?

2. What does the customer-ownership campaign cost in relation to the cost of mortgage bonds or other financing?

3. Why is customer ownership declining, or at least standing still, while general financing has increased by leaps and bounds?

BENEFICIAL TO PUBLIC RELATIONS

Without exception each of a representative group of executives approached by the ELECTRICAL WORLD in an attempt to evaluate the real worth of customer ownership agreed that such a policy has an exceedingly important bearing on public relations. P. S. Young, vice-president of the Public Service Corporation of New Jersey, said "it is not unreasonable to say that the adoption by this company of customer ownership of its securities and the consequent dissemination of facts pertaining to the operations of the various public utilities has resulted in improving public relations. Before the Public Service Corporation of New Jersey adopted the popular ownership plan of selling its securities to customers there was hardly a state or municipal election held but that Public Service was used as a talking point by some of the candidates seeking public office. This could have no other than a harmful effect on the Public Service Corporation of New Jersey and its securities. During recent political campaigns practically no mention was made of Public Service by candidates seeking office."

In answer to the same question Chester C. Smith, vice-president and secretary of the Kansas City Power & Light Company, said: "Customer ownership, in my opinion, has been of material benefit in improving the public relations of the utilities. I do believe, however, that the benefit which has been derived has in some instances been greatly overestimated. It has been the personal experience of our company that as soon as our customers have made a nice profit in their securities they immediately disposed of them and invested in other securities. This, of course, does not destroy the good will which has been created, but it did, in effect, minimize it because when the ownership was gone the interest in the company was not so pronounced."

Referring to the bearing of the question on relations, Herbert A. Wagner, president of the Consolidated Gas, Electric Light & Power Company of Baltimore, said: "Customer ownership has undoubtedly proved beneficial in improving public relations. Customer owners take far more interest in the utilities in their communities and their development and financing. Though these customers a better understanding is developed of the reality of stockholder ownership, of the soundness of financing

methods, of the necessity for a fair rate of return and the mutual interdependence of the local utilities and local communities."

E. J. Beckett of the Pacific Gas & Electric Company states that there can be no reasonable doubt of the merit of customer ownership in respect to public and political relations. He said: "Out here in California a proposal to put the state in the water and power business has thrice been defeated upon submission to the voters and in each case the stockholders of the central-station companies, now numbering in the neighborhood of 200,000, were without question largely responsible for the active opposition to the measure. These elections afforded a pretty tangible basis for gaging the political value of customer ownership and I believe that its effect on public relations, while hardly susceptible of measurement, has been equally beneficial.

Another reference to the political aspect of the situation is made by F. H. Farnum, manager of the securities department of the Central Maine Power Company. Mr. Farnum says: "In Central Maine Power Company territory during the past ten years the company has been subjected to several severe political attacks. There has been a gradual change in state-wide public opinion from one of hostility to our proposed measures and politics to one of greater friendliness. We believe that this improving public opinion and public relation is in no small measure due to our customer-ownership stock distribution."

Another specific reference to the political aspects of the situation is made by the manager of the investment department of the Southern California Edison Company, who says: "While the primary purpose of customer-ownership financing is to raise money in the local field for capital expenditures, it has assumed an equally important mission as an instrumentality in the promotion of better political, public and employee relations. The defeat of the proposed and pernicious water and power act in California three times in succession by an increasingly large majority may be largely attributed to the hundreds of thousands of power company security holders in the state.

Saving in Financing Costs

With respect to the cost of financing through the customer-ownership campaigns, a variety of opinions were given. The last-mentioned company states: "Speaking for the Southern California Edison Company only, the cost of selling securities through our customer-ownership campaign is, on an average over a ten-year period, about 60 per cent cheaper than the cost would have been for other modes of financing. The figures for costs are used in the underwriting sense and do not take into account the yield on the types of securities in question which would enter into a computation of real cost of money to the company."

Somewhat different has been the experience of the Potomac Electric Power Company. A. G. Neal, vice-president and comptroller, states: "There are many elements entering into the comparative costs of customer-ownership campaigning as compared to cost of financing through sale of bonds. It is undoubtedly most costly to finance through customer-ownership campaigns, but difficult to put the added value of the good will that flows to the company through this means as compared to that through the sale of bonds."

Referring to the question of costs, the Pacific Gas & Electric Company has had the following experience; "The average spread between the sale price of bonds to an underwriting syndicate and the price at which such bonds are offered to the public is probably from 3 to 5 per cent. Ordinarily, stock financing, on account of the relatively greater risk involved, might logically be expected to exceed this cost. In our own case, however, the cost of selling stock direct to the public has been very substantially below these figures. In the period from the middle of 1914, when this company initiated the customer-ownership plan, to the close of 1926 our average cost per $100 share of selling $64,700,000 par value of the stock direct to the investing public, without any underwriting, was 61 cents. I believe that this figure is, however, very considerably below the average stock selling costs of the industry as a whole.

It is obvious from what has been said that the cost of financing varies according to local conditions. A large company in the Middle West states: "It has been our experience that the cost of financing through customer ownership has been substantially the same as the cost of financing through investment bankers." A large Eastern company states: "Customer-ownership campaigns usually cost less than financing through underwriting or other methods of marketing junior securities." Still another large group with wide experience in customer ownership states: "The cost of money obtained through bankers varies between 3 per cent and 6 per cent, depending mainly on the class of security sold. Costs of the sale of the stock to customers varies principally with commissions paid to employees. In 1927 our costs amounted to slightly over 2 per cent."

Alleged Decline in Customer Sales

Replies to the third question, dealing with the alleged falling off of customer ownership, also disclosed a difference of opinion. A large Pacific Coast company states: "I should say that this is due to the fact of a plentiful supply of money in the last several years, enabling large blocks of securities to be marketed in a short time by placing the issue through bond and brokerage offices. Many companies not having large construction programs no doubt sold their whole issues in the above manner in a comparatively short time and, therefore, felt no necessity of making any sales themselves locally to their customers during the balance of the year. Personally, I think this is rather a shortsighted policy as the maximum value of customer-ownership campaigns, I believe, is through continuous contact with one's customers in the sale of securities." Answering the same question Mr. Young, vice-president of the Public Service Corporation of New Jersey, states: "This question was anticipated by the 1927 customer-ownership committee of the National Electric Light Association and the statement on page 1 of its report, which is quoted below, practically answers the question: 'It is entirely natural, with the new capital requirements of electric power and light companies varying from year to year and with financial conditions changing from time to time, that the type of securities chosen by the companies shall also vary. It is, therefore, not surprising that occasionally the volume of customer-ownership securities sold in any one year by the electric light and power companies should be less than in some previous year.'"

A slightly different explanation is given by the Central Maine Power Company: "On the Central Maine Power Company system the number of customer owners is not increasing for two reasons: First, because those already

owning the stock are increasing their holdings; second, because the tradeouts are almost equal to the number of new stockholders secured. With a limited amount of stock available the number of stockholders will not materially increase. In the case of the Public Service Corporation of New Hampshire there has been in 1927, and will be, a large increase in customer ownership during the present year.

A slightly different aspect of the situation is brought out by Chester C. Smith, vice-president of the Kansas City Power & Light Company, who says: "I am answering this question by saying that, in my opinion, this has been due to some extent to the low yield the securities offered. For example, in the period from 1920 to 1923 stocks and bonds were being freely offered to customer owners on a 7 and 8 per cent basis, whereas in 1927 this yield dropped to as low as 4½ per cent. In other words, customer owners as a general rule are not educated up to the investment quality of a security, but are more interested in the return or yield. This, in my opinion, accounts for the fact that the low-yield securities which were issued in 1927 had to be absorbed by discriminating investors such as insurance companies, trust companies and others investing funds in large amounts for private individuals."

The situation is concisely summed up by Herbert A. Wagner, president of the Consolidated Gas, Electric Light & Power Company of Baltimore, who said: "The sale of junior issues to customers was undertaken at a time when it became necessary and also possible to increase the ratio of junior securities. During and immediately following wartime borrowing had to be resorted to to an abnormal degree, and senior issues rose to unsound proportions. Financing almost entirely by the sale of junior securities followed this for several years. A large part of the more recent financing has been due to the refunding of bonds and preferred stock originally issued on high yield basis. When large issues are called it is necessary to have funds available promptly and surely and underwriting must be resorted to. A large part of the financing for plant improvements and extensions is still being done through customer-ownership distribution of junior securities and probably to a greater degree than heretofore."

Viewpoint of Electric Bond & Share Company

The attitude of the Electric Bond & Share group toward the customer campaign is of special importance in view of the wide use of this policy resorted to by Electric Bond & Share companies. The following statement by E. B. Lee, statistician of the company, is of particular interest:

> We feel most strongly that public relations are greatly improved by having a large ownership of company stock in the territory served. It is never possible for a public utility company to have perfect public relations, human nature being what it is, but certainly a customer owner looks upon the company that serves him with more friendly eyes than if he did not have his own capital invested in the enterprise.
>
> Your second question has to do with the cost to the company of selling its stock in customer-ownership campaigns as contrasted with the cost of selling the stock in wholesale lots to dealers for distribution. The experience of our associated companies is that there is very little difference in the cost to the company of these two methods of disposing of its preferred stock. There is a direct benefit, however, in having the stock sold locally in that company employees learn more about their company and come into closer financial contact with the public through selling the stock than if the stock were sold by outside bankers.
>
> Your third question is why the percentage of preferred stock sold in customer-ownership campaigns in 1927 constitutes a smaller percentage of the total securities issued by public utility companies than in previous years. This reduction in the amount of preferred stock sold in customer-ownership campaigns in relation to the total securities issued is due to the fact that during 1927 the public utility companies, especially those engaged in the electric power and light business, did a large amount of refunding of securities. Of course, they also sold large amounts of securities for new construction and for additions to properties, but the proportion of securities sold for these purposes to the total sold was less than for previous years.
>
> In this connection it must be remembered that during the years 1917 to 1921, inclusive, it was practically impossible for public utility companies to finance their requirements except at heavy cost. During these years securities sold by these companies carried high interest or dividend rates and were sold at prices to make the cost of money very high. It was not until 1922 that the companies found themselves in a position to finance themselves on anything like favorable terms. The improvement in money conditions continued through the years 1923 to 1926, inclusive, and during this time the companies issued large amounts of securities for new construction and additions and to take care of short-term loans and other indebtedness created during the years when financing was difficult. By the close of 1926 the companies had practically caught up with their construction program and during 1927 the amount of new construction was more normal. During the year, the cost of money having been so greatly reduced, the companies took advantage of the opportunity to refund those issues placed during the years when interest rates were much higher.

Investment Bankers Favor Plan

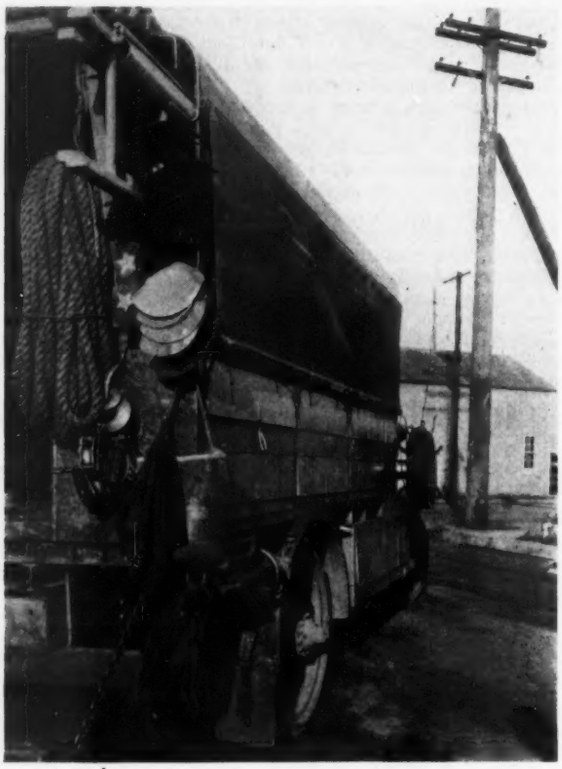
Turning from the attitude and experience of the companies to that of the bankers, one might possibly suppose that the investment banking fraternity would not be particularly friendly toward customer-ownership compaigns, since they naturally limit the volume of business available. Interviewed on this subject, Henry R. Hayes, vice-president of Stone & Webster and Blodget and president of the Investment Bankers' Association of America, said:

> The Investment Bankers' Association strongly favors the placement of securities among consumers. We have gone on record as favoring this policy so often that there is little to be added. However, it is of prime importance that only conservative securities be sold and, further, that they be sold at existing market prices. The part-payment policy is a sound method of installment selling and a happy way to encourage thrift. It is best for the consumer to become acquainted with the economics of his utility, but no consumer really should be enticed to buy utility stock unless he has a savings bank account, and perhaps liberty bonds and an insurance policy.

Another large banking house expressed the following opinion through one of its officers:

> As the trend toward customer ownership has become more pronounced, it has become increasingly apparent that the customer represents a consistent source of new money, and while the cost of money obtained through the sale of stock is higher than the cost of money derived from the sale of bonds, it is nevertheless necessary in order to maintain a well-balanced capital structure. Furthermore, if the stock is sold to the consumer (and to the employee) part of this increased money cost might be deemed chargeable to cost of maintaining good relations with customers and employees. The investment banker should have no objections to this method of financing, inasmuch as it is to his advantage for the company to maintain good public relations and a well-balanced capital structure. Furthermore, as it is impossible for most companies to care for their principal financial requirements in this manner, it will not in the long run seriously restrict the business of the investment banker.
>
> At the same time, as pointed out above, by maintaining a good balance of stocks to bonds, the issues handled by the investment banker should be backed by a stronger equity than might be the case if the company did not sell its stock locally. For the banker handling stocks as well as bonds, this might reduce the issues available, but the fact cannot be overlooked that much of the stock is sold to the small investor who, prior to his purchase of the stock of his local electric company, placed his surplus money in a savings bank, a local building and loan association or in local real estate mortgages. Thus it is possible that by selling stock to employees and customers the electric light companies are educating a new class of investor to the possibilities of investing in the securities of corporations. This cannot help but eventually redound to the benefit of the investment banker.

Power-Driven Take-up Reel Mounted on Line Truck



FIVE trucks of the Northwestern Electric Company, Portland, Ore., are equipped with a line-wire take-up reel attached to the niggerhead of a power-driven winch near the front of the truck. The arms of the reel are mounted on a steel plate which is fastened to the niggerhead of the winch with cap screws, making the reel easily removable. By loosening the screws holding the outer arms of the coil-forming reel the arms may be swung in toward the center for removing the coil of wire.

Substation Inspections

By O. M. Ward
Assistant Electrical Engineer Milwaukee Electric Railway & Light Company, Milwaukee, Wis.

INSPECTION REPORT forms used by the Milwaukee Electric Railway & Light Company for different types of equipment have been described from time to time in the Electrical World. In addition to those forms, there are a number of others of less complexity and detail and also certain summary forms by means of which the chief operator is kept continuously informed of the status of all inspection work undertaken in the various substations.

The shorter forms each cover a definite item. The one on oil switch inspections carries space for notations on the condition of the contacts, of the oil, of the operating mechanism, and of the control. Intervals between regular oil-switch inspections vary from one month to two years, depending upon the equipment or line to which the switch is connected. But inspections are made annually and this form reports the bus voltage, conditions of insulators and connections, cleanliness, and conditions of buses generally. The miscellaneous equipment inspection, which is made at intervals of from six months to two years, is reported on a form which, on account of the impossibility of its being made specific, is mostly taken up with space for remarks.

The operations of automatic switches and contactors are recorded by Veeder counters, the readings of which are taken once a month. These readings, together with identifying descriptions of the equipments and line-ammeter readings, are reported to the chief operator. His accumulated records show the total operations for each month and for the preceding twelve months, and also the monthly average for the particular class of equipment during those twelve months. If the number of operations at any time appears excessive in comparison with the average, a special investigation is made to determine the cause of the condition.

The summary inspection report form, which is kept by the chief operator, consists merely of a date-recording blank, in which he enters the inspection dates for all apparatus and equipment. With this record, he is enabled to keep informed of inspections completed and due, and can, at any time, tell pretty closely the condition of any equipment in any station.

Revised Handling of Customers' Complaints

By J. W. Williams
Director Public Relations
Binghamton Light, Heat & Power Company

COMPLAINING customers are the ones who deserve the most attention. Previously all customers' complaints were handled through the meter department. Upon receipt of high-bill complaints the meter was generally tested, but many customers would come back dissatisfied. The customer is seldom interested in what the meter test shows and must be shown where the current actually was used, or must be convinced of the value of the service rendered for the rate charged.

It has been difficult to induce meter men to adopt a sympathetic attitude toward the customer. They are convinced before they start that the meter must be correct, because they have tested many meters and found only a very few fast. This attitude does not appease the customer.

Under our present method complaint men are used who have been trained in every department and who can test a meter if a customer insists. In most every instance they are able to find some cause for the increased consumption that satisfies the customer, so that it is not necessary for the customer to come back and discuss the same complaint all over again. If the increased consumption has been caused by some device that the customer just started using the customer is shown how slight the daily increase in cost is compared with the service given by the particular appliance. This encourages the customer to continue using the appliance rather than neglect its use to reduce the electric bill, as occurred when inexperienced complaint men were employed. The complaint man not only satisfies the complainant but also explains rates and bills, instructs customers how to read meters and shows them how to replace their fuses, etc.

When a complaint is received that cannot be satisfied at our complaint counters a complaint order is made out in triplicate. On this complaint order is shown meter data, last reading, twelve months' consumption and any remarks which the counter clerk has gathered from his

conversation with the customer that will be helpful to the complaint man. The record of this complaint is entered on a log sheet, triplicate copy being filed numerically at the counter as a check on the prompt return of original by the complaint man, or in case of a line complaint to assure that the line department completes the work in a reasonable length of time. The original and duplicate of the complaint order go to the complaint man; he retains the duplicate for his records and returns the original to the counter when his work is completed. When the original is returned to the counter the triplicate copy is destroyed.

A comparison of results obtained under the old and new method of handling complaints is interesting:

Old Method—Report of meter tester:

"Could find no reason for high bill except that customer is using lights."

New Method—Report of a trained complaint man:

"Customer leaves a 25-watt lamp burn all night in bathroom. Children also leave back porch light on frequently all night. I found they had young pups in the cellar that would not eat without lights on, and customer admitted that they forgot these frequently. Satisfied."

This method of handling complaints has reduced special meter tests 75 per cent.

Electric Trucks Charged at Outdoor Loading Platform

"THE fact that we are constantly purchasing additional electric truck equipment is proof positive that the service rendered has been satisfactory from every angle," said George Ford, superintendent American Railway Express Company, at the recent Electric Truck Conference in New York City. This organization operates a total of 1,528 electric vehicles in eighteen cities of the United States. Of this number 561 are operated in Greater New York. The kilowatt-hour consumption in Brooklyn, Long Island City, New York City and Jersey City totaled 5,401,900 in 1927.

At least 40 minutes per car per day is saved, according to Mr. Ford, by the charging of batteries while still in the truck and while the latter is in position at the loading platform. This practice obviates the necessity of the twice-daily run between the New York garage and the terminal in Long Island City. Weather conditions have, particularly in winter time, seriously complicated the plan, but experience over several years indicates the over-all value of the scheme. There are 125 charging outlets distributed around the outer edge of the platform.

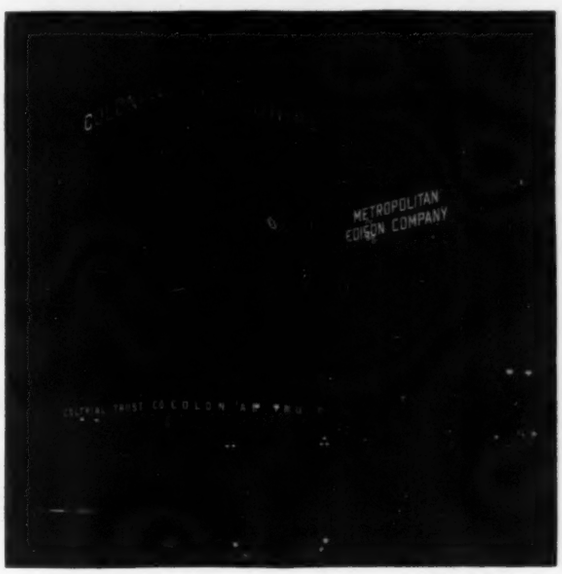
In speaking of the difficulties of winter operation, Mr. Ford stated that the fact that actual failures on electric trucks or the number that were out of service during the winter did not cause the operating department any inconvenience is a fair indication of just what abuse an electric truck may be subjected to and still operate satisfactorily. "While we stored 125 electrics at the Long Island terminal and about 45 gas cars, it was always necessary in the morning to get an electric to tow the first gas car and get it started so that the remainder could be pulled around the platform and started up pending the driver's arrival.

"We at present are operating in New York City some 80 2-ton electric vehicles that are in their seventeenth year and also 120 that are in their twelfth year. It is particularly interesting to note that while years of service continue to accumulate on these vehicles, the repair and maintenance item remains about the same."

It is estimated that 28 per cent of the vehicles operated on an average of twenty hours daily and the remaining 72 per cent an average of fifteen hours.

Sign Lighting Averages 85 Kw. a Block in Reading

SIGN lighting loads in the eight blocks of the main business section of Reading, Pa., total 680,000 watts, according to statistics of the industrial lighting department of the Metropolitan Edison Company, a subsidiary of the General Gas & Electric Corporation. This unusually high concentration of lighting for a community the size of Reading, approximately 114,000, has been secured largely through practical demonstrations by the company of the results that can be obtained with adequate illumination. Merchants have had proved to them, by installational examples, the sales and attention-arresting values



Utility sign and comparative-letter-lighting demonstrate relative publicity values

of bright but unglaring effects in window lighting. The same plan has been applied to the improving of sign loads.

The new twelve-story office building of the Metropolitan Edison Company has been topped by a sign bearing the company's name in letters 10 ft. high. It is of a double-face type containing 2,600 25-watt lamps. The effectiveness of this display was such that other neighboring signs appeared dim in comparison. One illuminated-letter device, equipped with 810 10-watt lamps, was changed to 25-watt equipment after a comparative demonstration on one letter had indicated the relative publicity values. As a result of such work an increase of 47,000 watts was made on 21 signs with an appreciable gain in revenue.

Five advertising devices which had been allowed to fall into disuse were reconnected at 32,000 watts, and new signs and poster-board illumination last year amounted to 218,000 watts. In this work the commercial department of the utility obtains estimates for the fabrication and installation of new signs from several companies, leaving the conclusion of final negotiations to the buyer and seller. No signs are merchandised by the utility.

Value of Campaigns Established

AS A result of twelve major sales campaigns during the past year the Georgia Power Company has developed definite evidence regarding the value of such efforts. Out of the total sales, amounting to $1,600,000, more than $1,000,000 worth of goods were sold during the special campaigns. The annual quota was exceeded by $200,000. A comparison of campaign sales with total sales of some of the items is shown in the accompanying table.

SALES AND CAMPAIGN SALES

Item	Total Sales	Campaign Sales	Percentage in Campaigns
Electric irons	7,707	5,679	73.6
Gas ranges	3,971	1,693	42.6
Waffle irons	1,422	1,272	89.5
Electric ranges	1,163	1,003	86.2

VALUE OF SALES

Item	Value	Item	Value
Electric refrigerators	$632,602	Electric irons	$28,111
Electric ranges	147,456	Electric waffle irons	12,656
Gas ranges	87,114	Gas water heaters	5,763
Radios	55,720		

Factors entering into the success of the Georgia Power Company's sales campaigns include the division of the state into sections, with a sales force in each; a special price to customers on the items offered during the campaign; free demonstration in the home of the customer, and terms on the articles extending from ten to twelve months. Extensive advertising also played an important part in putting over sales, advertisements being carried in a dozen daily and 40 weekly papers.

Electric Dehydration of Oil

IT HAPPENS frequently enough to constitute a problem that crude oil as it is pumped from the well is emulsified with water. Since the pipe line companies will accept nothing but pure crude for transportation through their pipes it is up to the producer to break down the emulsion and take the water out of the oil. The common practice is to apply heat to the oil in a series of cookers. This process of demulsification is now, to a growing extent, accomplished by electric dehydrators, states O. A. Jennings of the Oklahoma Gas & Electric Company.

The oil containing the emulsion is passed through an electrostatic field between two electrodes at a potential difference of about 11,000 volts. The discharge between the electrodes breaks down the emulsion and the water settles out. Aside from making the crude oil acceptable for transportation through pipe lines the Baumé gravity figure of the oil is raised and its market value thus increased. The increase in value is usually sufficient to pay for the treating equipment in nine months or less. The average power consumption of an electric dehydrator is in the neighborhood of 2,000 kw.-hr. per month, varying according to operating conditions between 1,200 and 5,000.

Notes on European Conditions

Result of Interview with

PHILIP TORCHIO

Vice-President New York Edison Company

ONE visiting Italy and Switzerland is impressed by the remarkable development of railroad electrification. Switzerland has nearly completed her program of electrifying 60 per cent of her railroads. Italy is actively engaged in expanding her railroad electrification and in about a year one will be able to travel from France to Naples on a continuous electrified railroad.

In all the manufacturing plants I have visited in these two countries I have found considerable work in building apparatus for railroad electrifications.

The electric light and power industry in Italy is in a remarkably sound condition. While in the past years the rate adjustments to the depreciated value of the currency have lagged behind the movement of depreciation, with the returned appreciation of the lira of the last year the net returns have materially improved, notwithstanding a slight decrease in gross business during this year of economic readjustment.

One obstacle to the free development of the industry in domestic application is the heavy state and municipal taxes on all lighting bills. This does not apply to power. These taxes average about 60 per cent and are so worked that the electric undertakings are really made tax collectors of this 60 per cent extra for the state and the municipality. If a consumer desires to use any heating or power in his home, he usually demands that the supplying company furnish a separate meter service, so as to avoid the taxes that he would have to pay if he used only one meter for light and power.

The electrification of the industries has perhaps progressed to a greater degree than in any other country. The industrial rates are very reasonable and compare favorably with those of other countries. In the next two years more than 1,000,000 hp. of new hydro-electric plants will be placed in service, thereby making liberal provision for the expansion and growth of electric service in all lines of industrial and domestic activity.

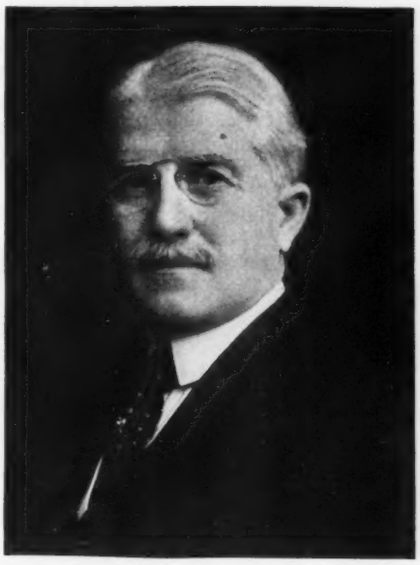
The new telephone companies which, about three years ago, took over the local and interurban state telephone systems have made great improvements. In the large cities certain new, or almost new, details, such as taxi service calls, railroad information service, etc., have been introduced with great success. The state long-distance telephone lines are being entirely revamped, using underground armored cable buried in the ground. The use of overhead cables had to be abandoned on account of the hunters for birds shooting at the cables.

Industrial Decentralization

and Its Effect on Interconnected Systems

An Interview with
GEORGE M. VERITY
President American Rolling Mill Company
Middletown, Ohio

SPREADING of industry over large areas and its effect on speeding up the growth of electric transmission and distribution networks over those areas is pointed out by George M. Verity, president of the American Rolling Mill Company, as an important factor in the wider application of electric power to the home and to the farm. He further said that it is incumbent as a social obligation of industry to promote the development of the electric light and power business if other considerations are equal or not too greatly diverse. In outlining the reason for his conclusions Mr. Verity said: "It is acknowledged that the key to all economic progress is power. It is agreed generally that the prosperity and progress of our country rest on the fact that the American workman is a director of the labor machines rather than a user of his own muscular force. The average utilization of power in American industries is now something more than 4 hp. per worker. This figure is more than double that of twenty years ago. Translated into terms of sweat of the brow, 1 hp. is equivalent to ten men. The American workman of today is the equal of more than 40 men working with their hands and backs. The mechanical power for the operation of machines is best supplied by electric motors. This is self-evident. Ease of control, variety and flexibility of application make electric power pre-eminent for industrial use.



George M. Verity

"In addition to its direct service as a multiplier of production, electricity now makes another contribution to industrial progress, a contribution that in the future will increase. It is making more easily possible the locations of factories in small cities and towns. Industrial activity, so far as it is influenced by availability of power, may be removed from congested centers of population. An outworn argument for the locations of industries in so-called "industrial centers" has been that labor is plentiful in those centers. This is true. Labor, of a kind, is usually plentiful. But with that labor industry accepts the evils of a competitive labor market, of labor living in slums and less effective in consequence, of selfishly factional local governments and of labor's disinterest in everything except wages.

"Contrast with this the advantages of the small city. The plants of the American Rolling Mill Company are located in small cities. In these we know that the homes of our employees are brighter and more comfortable. We know that the eight hours of the day remaining after work and sleep are taken out are healthier and happier. We know that recreation is diversified and largely in the out-of-doors. We know that there is a closer contact with and a greater interest in religion than in the large city. We know that social life is at its best. We know that contact of our employees with community and municipal problems is closer and their participation in the administration of local government is on a broader and less sectarian basis. We know that the community of our employees is an important entity in the small city. We know these things because they are the reasons why our plants are located in small cities.

"There is more to the contract between labor and industry than the simple paying of dollars for a day's work, no matter whether the dollars paid are many or few. This is not to say that industry, with paternalistic gesture, should attempt to force on employees, or even offer to them, extra compensation in the shape of community benefits, which quite naturally may be received with resentment rather than thanks. It simply means that the industry is itself a part of the community to which the employees also belong. The industry has obligations to the community in proportion to its size. These obligations must be discharged understandingly and without the possibility of any suspicion that the industry is "running" things. The best way to escape that suspicion is to give no grounds for it, and grounds will not be given if the industry simply does its fair share in local government. The employees, too, have obligations to the community. Their obligations also must be discharged if the contract is to be lived up to. This all boils down to the statement that both employer and employed must develop an awareness of social duties, the performance of which will result in benefit to both. Nowhere but in the small town, where relative sizes are greater, can this condition be realized. This is why "Armco" is committed to the small town.

"I am told that electricity can be economically transmitted 200 or 300 miles. This means that power may be had within areas of such radius from generating plants. I am told also that improvements in steam plant efficiencies smash the idea, popularly held, that electricity must be cheaper in areas where water power is plentiful. This means that industries may be located without special

regard to power supply, because power will be plentiful and low priced almost anywhere. In fact, we have gone quite a way on that road already.

"It seems to me that the spreading out of industry over large areas of country, which will be the effect of locating factories and plants in small towns, will greatly speed up the growth of electric transmission and distribution networks over these areas. This will help enormously in the job of bringing electricity to the 6,000,000 American farms that are waiting for it. The farmer now must pay a comparatively high price for electric service because the investment required to serve him is high. The cost to the farmer would be less if there were a few industrial plants taking their power from the same line that he takes his from, thus increasing the revenue factors of the line.

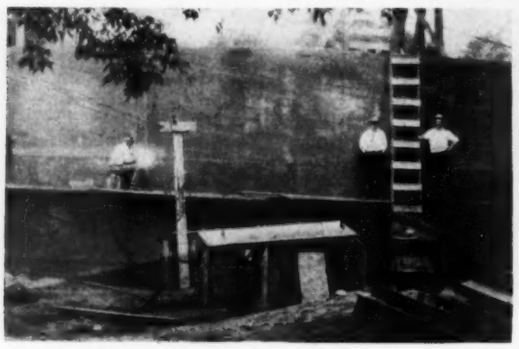
"The production and distribution of electricity is a distinct and separate economic function that, I think, can best be performed by organizations devoted to that work. It is not only true that, in the usual case, electricity can be supplied as economically, or more so, from a central system as it can be generated in a private plant, but from a social standpoint it is desirable for industries to take power from a supply system. This is on account of the fact that the prosperity of the individual rests on the prosperity of the nation. National prosperity, its continuance and enlargement, is in no small degree dependent on the more extensive application of electric power, not only to the industrial plant but to the home and to the farm. This widening application can be maintained and extended only through electricity supply systems. It is then, other considerations being equal or not too greatly diverse, incumbent as a social obligation on industry to promote the largest development of that agency—electricity supply systems—which has so important a rôle in the progress of the country.

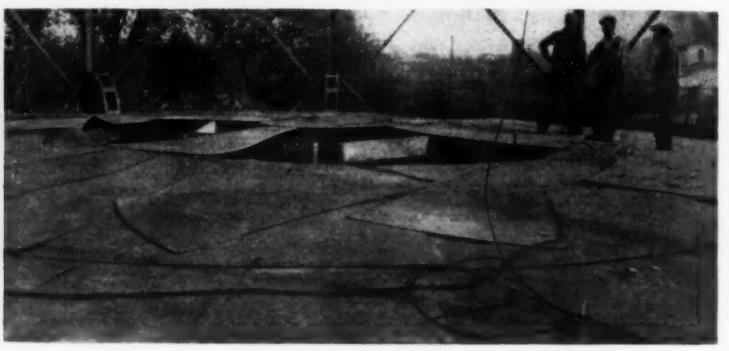
"There is the picture. Capital is fast learning that it is a partner with labor on nothing more than an equal basis. The contentment and happiness of labor depend as much on conditions outside the factory as inside. The security of capital depends on the contentment of labor. Labor, respecting self and others, contented and interested in getting the most out of life, gains in respect, contentment and interest as it moves away from population congestion. Industry, for its own good, goes to the small towns. Electricity supply systems, already spread out over the United States in interconnected networks of enormous extent, grow larger and become closer woven on account of the spreading out of industry. The nation continues at accelerated pace toward her destiny of a happy, continuously prosperous and united people."

Electrically Welded Gasholder

AN ALL-ELECTRIC arc-welded low-pressure gasholder of 300,000 cu.ft. capacity has recently been completed at Albion, Mich. The construction and design are both the work of the Western Gas Construction Company of Fort Wayne, Ind. The holder, with all lifts elevated to their maximum height, stands 113 ft. 7 in. above the foundation. It has a diameter of 74 ft. and weighs 516,385 lb. plus the weight of the welding rod that was used. This is said to be the largest low-pressure gasholder built entirely by arc welding.

One of the great advantages of using electric welding on gasholders lies in the gas- and water-tight features of the construction, according to F. H. Beebe, vice-president of the Western Gas Construction Company. "Building a gasholder by electric arc welding has inherent practical advantages that recommend it strongly. It simplifies construction and reduces fabricating cost. When a gasholder is made of riveted plates it is necessary to employ the tank shop to lay out and punch all the members. When metallic arc welding is used it is only necessary to lay out and punch the members in the shop for fitting-up bolts. The plates are, of course, rolled to the proper radii in the shops. On this job the plates were assembled in position with bolts and tack welded with the exception of the cups and grips, which were fabricated in the shops and assembled in sections on the ground."





Portable equipment speeds welding of gasholder. Assembly is simplified by the welding of rolled plates

Tack welding follows the laying out of the plates upon a temporary structure and precedes the final welding work

On this gasholder 4 tons of electrode welding rod were used. If a holder of the same size were made of riveted construction 7½ tons of rivets would be necessary. Four "Stable-Arc" welders manufactured by the Lincoln Electric Company, Cleveland, Ohio, placed 21,414 lineal feet of welding. The entire job was carried through almost without a hitch and with much less difficulty than would naturally be expected with a new structural process.

Wiring Practices Improved by British Organization

THE newly formed National Register of Electrical Installation Contractors has just recently held its first annual meeting at the Institution of Electrical Engineers in London. The chairman, P. V. Hunter, pointed out that the register was not a trade organization, but a body to protect the public from the irresponsible wireman and his shoddy and dangerous workmanship and to raise, by means of a national register, the efficiency and status

of installation contractors in connection with the application and use of electricity for any purpose.

The register covers Great Britain, the Irish Free State and northern Ireland. Evidence of competence and responsibility and the occupation of suitable business premises are required as a condition of registration. The number of applications received so far is 1,378 and the number on the register is 1,086. Increasing interest in the advantages of registration is being shown by supply authorities and especially by those who have adopted assisted wiring schemes, many of whom have restricted installation work to registered contractors. No complaints of bad workmanship against registered contractors were lodged during the first year of the register's existence.

Letters from Our Readers

Sales Policies—Not Electric Heat at Fault

To the Editor of the ELECTRICAL WORLD:

Frank expressions of opinions, like T. P. Kindig presented in the April 28 issue on "What Is the Matter with Industrial Electric Heat?" are what the industry needs if it is going to progress. Too many discussions on timely topics are framed to avoid offense and they don't get anywhere. Whenever there is a lackadaisical attitude on a situation that requires action we need some straight-from-the-shoulder punches. Better to make some mistakes than conceal conditions that need correction.

Since Mr. Kindig indulged in expressing himself freely I am going to take the liberty of doing likewise.

First of all, there is nothing the matter with industrial electric heat. The slowness of progress in this development, which will eventually involve a load and energy consumption equaling or exceeding motor applications, is due to weak sales policies and selling methods.

The sooner manufacturers, or utilities, get over talking about who will benefit most by the acquisition of the new load and get down to joint participation, realizing that the benefits to either will justify all the work either can put into promotional work, the quicker will results come. Of course, utilities will get a yearly revenue from each installation, but these installations will also bring manufacturers repeat orders just as early motor installations did. "Passing the buck" never brought results.

The attitude of some combination gas and electric utilities or electric utilities affiliated with gas properties constitutes another major hindrance to the deserved growth of industrial applications of electric heat. It is natural for such companies to protect the investors in gas utilities by not stealing away gas applications and replacing by electric. For the combination companies the net immediate result would be zero. But should these situations put a stopper on all activity to secure applications of electric heat?

Surveys by any utility will show that there are plenty of heat applications to work on which are using neither gas nor electricity. If electric operation will be more beneficial to the customer than gas operation, he should be given electric operation, and vice versa. But the debate between the values of the two services should not be carried into the customer's office. It should be settled before customer approach by the gas and electric salesmen. If there is disagreement, then an executive in charge of both services should referee the decision. Debates between gas and electric salesmen in customers' offices have usually resulted in losing the business to oil.

What value will the existing sales policies of some gas-electric companies have if, a few years hence, customers decide for themselves that they want electric instead of gas operation? Better to sell them now what is best for them, so a lot of embarrassing explaining will not have to be done in the future when they voluntarily make a changeover.

Another reason why some utilities have put so little effort into developing electric-heat applications is because they think that such applications are available only in automobile centers, or where metallurgical furnaces are dominant. They haven't analyzed their market by listing every customer's applications which require heat and classifying the possibilities for electric heat as good, fair or remote. A few companies have or are making such surveys and other utilities will wish they had when they see the progress which will be made by the progressive companies which have had courage enough to appropriate money for a survey.

If utilities will analyze their possibilities for increasing motor loads above those which come from industrial expansion due to population growth many will see that they have to develop new markets.

Assuming a utility as interested in industrial electric heat, why the half-hearted sales efforts in acquiring it? Representation of utilities at manufacturers' sales schools on industrial electric heat would make it appear that there is only enough business to support two or three fair-sized utilities. Can the surveys which a few utilities and manufacturers have made of the potential market be so far astray as that?

As Mr. Kindig pointed out, the sales force that utilities have put on industrial-heat load acquisition is entirely out of proportion to the sales force working on motor applications. If the new business which can be acquired from industrial heat loads is equal to or greater than that from existing motor loads, what is the basis for devoting 10 per cent or less of the sales effort to the coming load and 90 per cent or more to a business which has already been developed. Sales forces should be based on the value of the reasonably obtainable market.

Finally, there should be more accumulation of selling-data ammunition, which will be facilitated by greater co-ordination of utility, oven manufacturer, and electrical manufacturer selling forces. As proof of the lack of fact-selling, I would wager that the ELECTRICAL WORLD'S editorial pages would not be burdened if all the factual data on which specific electric-heat applications have been sold during the last five years had to be published promptly.

GEORGE H. GETTER.
New York City.

Overbuilds Reading Railroad with 66-Kv. Lines

To the Editor of the ELECTRICAL WORLD:

I note in the April 7 issue of the ELECTRICAL WORLD, on page 709, three cuts showing transmission structures over the Reading Railroad right-of-way in connection with the Conowingo lines. Unfortunately these are indicated incorrectly as being 220-kv. lines. They are actually the 66-kv. circuits from Plymouth Meeting substation, the 220/66-kv. transforming substation, to Westmoreland substation.

P. H. CHASE,
Engineer Transmission and Distribution Division.
Philadelphia Electric Company.

Digest of Electrical Literature

Hydro-Electric Development and Steam Equipment

Hydro Plant Achensee (Tyrol).—P. SIMON.—Last September the Achensee plant, the largest Austrian hydro-electric power station, was put into operation. Two natural Alpine lakes, located 6,500 ft. above sea level, were connected and provide the water supply and storage. From there a quadruple pentstock line, under an average inclination of 45 deg., leads to the power house in the valley, giving a useful hydraulic head of 1,200 ft. The station generates single-phase power at 16⅔ cycles for the Austrian Federal Railways and three-phase, 50-cycle for general power supply. There are installed four single-phase units of 8,000 hp., two three-phase sets of 15,250 hp. each and two more three-phase sets of 31,000 hp. each, totaling 124,500 hp., which will produce an average of 150,000,000 kw-hr. annually. The railway generators are driven by single-runner Pelton wheels, the three-phase machines by double wheel turbines of the same type. Transformers step the 16⅔-cycle potential up to the feeder voltage of 55 kv., the 50-cycle power to 115 kv. The outdoor switchgear is remotely controlled from a switching room.—*Zeitschrift des Vereines Deutscher Ingenieure,* March 24, 1928.

New Extension to Shanghai's Electricity Plant.—Upon the completion of the work now under construction at the plant of the Shanghai (China) Municipal Electricity Department the capacity of this station will be 120,000 kw. This addition, made necessary by the increase in the use of electrical energy in the territory served, involves the placement of two 20,000-kw. turbo-alternators. Boilers are provided with pulverized fuel equipment each having a steam generating capacity of 140,000 lb. per hour under normal load and 185,000 lb. per hour maximum at a pressure of 350 lb. per square inch and a temperature of 700 deg. F. The construction includes dust catchers fitted to the stacks to eliminate the dust nuisance often associated with the use of pulverized fuel.—*Far Eastern Review,* March, 1928.

Illumination

Photoelectric Photometers. — In a series of three papers in this publication, the methods of photoelectric photometry, experiences and the progress that has been made in developing such devices in one laboratory are given. This method of photometry, which substitutes an electrical eye for a human eye, eliminates many of the former difficulties in photometric work. The general characteristics of the equipment and the possibilities involved in its use have been fully outlined. Four separate systems have been developed and a comparison of the practical application of these several devices has been made and the adaptability of the equipment to commercial photometry indicated. — *Transactions of the Illuminating Engineering Society,* April, 1928.

Standardization of Methods of Heterochromatic Photometry.—A. H. TAYLOR. — Experimental results of photometric tests of twelve colored filters, varying in color from saturated purplish-blue to saturated red, are given in this article. Measurements were made by flicker photometer, using a number of observers and by a spectro-photometer. Integral transmission factors computed from spectral transmission data were in satisfactory agreement with those obtained directly from flicker photometer observations for all but one filter. A proposed standardized method of procedure is suggested by the author for use in heterochromatic photometry. — *Transactions of the Iluminating Engineering Society,* April, 1928.

Transmission, Substations and Distribution

Horizontal Cooling Ducts on Transformers.—F. STECKLER.—On core type transformers with disk coils narrow oil ducts are provided between the disks to provide oil circulation. The size of these ducts is determined largely by mere assumptions, based on more or less reliable operating experiences. The article approaches this subject mathematically, pointing out how readily overheating, sludging of oil and carbonization of the insulation may occur when these ducts are too narrow. On wide coils oil circulation in a horizontal direction may only be expected at the right and left end of the disk section, while the middle part is stagnant and therefore endangered. The width of the duct should always be proportional to the width of the coil. A greatly improved cooling action could be obtained if the disks were wound with slightly rhombic cross-section copper instead of rectangular strips. This would give the disk coils a slight conical shape and would give all ducts an upward slant. A very small angle would increase circulation materially. — *Elektrotechnik und Maschinenbau,* March 25, 1928.

Power-Factor Improvement. — Considerable attention is being devoted by French engineers to the subject of power-factor improvement and the report of an investigation by one company is recorded in this article. As the result of several determinations L'Ouest Lumiere found that power-factor improvement in large plants was generally best effected by readjustment of the size of the motors, by the use of static condensers and by the adoption of synchronous or compensated induction motors. In the improvement of medium-sized plants it was generally found that users preferred to adopt an arrangement for the improvement of the whole plant, which obviated changing the distribution of motors or power transmissions. The arrangement most often employed in France is said to be the synchronous compensator, increased attention being given, it is stated, to the manufacture of smaller sizes. Improvements at the generating station and at different points of the system have been considered at some length and the subject of special tariffs allowing for corrected power factors is discussed.—*World Power,* April, 1928.

Units, Measurements and Instruments

The Dilatometric Study of Light Metals.—MAX HAAS.—The dilatometric study of iron and its alloys by other investigators led the author to systematic dilatometric examinations of light metals and their technically important alloys. The apparatus used in this investigation was the Oberhoffer-Esser dilatometer with oil damping of the dilatometer housing and with the furnace dilatometer tubes and dilatometer casing stand at right angles to the camera. There are two means of optical registration, either in the direction of the furnace on a screen covered with a sensitive photographic paper or by reflection of the light rays on a protographic plate by means of a mirror set at an angle of 45 deg. Investigations were made of pure aluminum; silumin, a pure eutectic aluminum-silicon alloy; aluminum copper alloys and duralumin. — *Engineering (England),* March 16, 1928.

A Method for Determining the Condition of Current Transformers While in Service.—A method for determining the existence of short-circuited windings in current transformers while the transformers are in service and loaded has been devised and experimented with by one of the member companies of the N.E.L.A. When making this test no measurement need be made on the primary side of the current transformer. This test was devised primarily for installations where it is not possible to interrupt the customer's service and for installations where the voltage of the primary service is of such a high value that it is not possible, from a safety standpoint, to use the split core type of current transformer for a rough ratio measurement. It has been found experimentally that short circuits in current transformers are readily detected by this method, if

errors of the order of 2 per cent or more occur at the wattmeter due to the short circuit. It is stated that the method proposed in this report is not advocated as a complete solution for all phases of the problem. The experience with this procedure has been limited to such an extent that it is only suggested that the method may, after exhaustive research, prove as practical as preliminary tests indicate.—*Serial Report National Electric Light Association*, March, 1928.

Motors and Control

Squirrel-Cage Induction Motors.—D. B. HOSEASON.—The principal features of an electric motor are discussed and the characteristics of the squirrel-cage machine are considered in relation to them. The disadvantages of the squirrel-cage motor are then examined and their importance on certain types of drive is considered. Various methods of overcoming the poor starting performance characteristics are dealt with. The characteristics of high-resistance rotors for both continuously rated and short-rated motors are discussed and the advantages of the double-squirrel cage rotor over many of the alternative proposals, are also considered. A close examination of the starting currents drawn by squirrel-cage motors under various conditions of starting is made and the subject is considered from the point of view of the utility engineer.—*Journal of the Institution of Electrical Engineers (England)*, April, 1928.

Electrophysics, Electrochemistry and Batteries

New Insulating Compound. — W. MEYER.—With the exception of porcelain, the best dielectric material obtainable today is rolled or laminated paper, impregnated with artificial resin. Its high puncture strength applies, however, only across the layers. It is neither weatherproof nor fireproof. A Swiss concern has developed a new material, called "Diel," made from a condensation product, which is claimed to be of homogeneous structure throughout, is waterproof, does not burn, is insoluble in hot oil and has a specific weight of 1.35. The new material is manufactured in rods, tubes and plates. Results of a large number of tests are given to show puncture, creepage, arc resistance, flashover and mechanical strength. If these claims are substantiated, which seems to be indicated by practical tests of long duration, this new compound should find a large field of applications for high-voltage outdoor insulation. *Bulletin de l'Association Suisse des Electriciens*, March 22, 1928.

Electrolytic Iron.—The production of electrolytic iron received little or no attention even after the successful application of refining copper by electrolysis because of the low intrinsic value of iron and the difficulties of obtaining it in a form suitable for commercial purposes. The electrodeposition of iron suitable for commercial use is stated to be a very difficult problem as compared with the electrodeposition of copper, zinc, lead, nickel and many other metals. Owing to the magnetic properties of the electrolytic iron it offers advantages in the construction of transformers, generators and motors. By using sheets of this material the weight efficiency of transformers may be increased about 35 to 45 per cent; in the case of alternating-current motors and generators an economy of about 16 per cent can be effected in the weight of the iron used. It is well known that the losses tend to increase with the time of service of a transformer and the deterioration of the plates takes place more rapidly as the temperature increases. Electrolytic iron gives no trouble from aging as its crystalline structure is very stable. The author has reviewed the various factors involved in the production of this material and offers an outline of the economic consideration.—*Engineering (England)*, March 23, 1928.

Traction

Action of High-Speed Breakers for Railway Protection.—C. BEGIS.—Statistics indicate that there is one short circuit for every 310 train-miles on electrified main railroad lines. The most successful means of protecting the equipment against possible damages from such short circuits are the recently developed high-speed circuit breakers. With the co-operation of the French federal railway system the author has made an extensive study of this subject and gives a report of his work. More than 500 oscillograms were taken under various short-circuit conditions on the 1,500-volt direct-current system. It is claimed that never before have similar tests been made under actual railway operating conditions on such a large scale. The calibrated oscillograms give an excellent proof of the fast current interrupting action of high-speed breakers. Overvoltages as high as 2,500 and 10-ft. arcs were recorded.—*Revue Générale de l'Electricité*, March 17, 1928.

French Railway Electrification. — CHAS. J. WEBB. — The progress and practices involved in the electrification of the Midi Railway (France) are outlined both as to rolling stock and energy distributing equipment. The project involves a 150,000-volt transmission line for long-distance transmission of energy. Conversion to 60,000 volts is made for general distribution and transformed by means of rotary converters and mercury-arc rectifiers to 1,500 volts direct current for tractive-unit use. A special flexible driving coupling has been devised and is installed in many of the locomotives in connection with this development. Passenger trains are fitted with electric regenerative braking, while freight locomotives have rheostatic electric brakes controlled by varying the field of the motor.—*Electrical Review (England)*, April 20, 1928.

Heat Applications and Material Handling

Fundamental Principles in the Design of an Electric Furnace.—TSUNEZO KAWASAKIYA.—It is the contention of the author that the design of electric furnaces and other heat-treating apparatus is far behind that of other electrical equipment, and the object of the present investigation is to establish a technical foundation for this line of engineering. The analytical expression by geometrical quantities for conditions in the surrounding walls of an electric furnace is offered as a substitute for the usual algebraic solutions. Thermal equations have been derived to express the steady distribution of temperature, heat flow and stored energy in the walls through which an electric current passes. Simple relations derived by introducing equivalent physical constants for composite walls; an apparent thermal capacity which is denoted by the steady thermal energy stored in the furnace, divided by the temperature rise and corrected by means of an empirical expression; practical thermal equations applicable for a furnace operating intermittently; economical conditions to be kept in mind in the determination of the general contour of the furnace; resistance of the surrounding walls, and the resistive qualities of the material with the viewpoint of economy and application of the theories developed by means of specific numerical examples are given by the author. It is concluded that the principal value of the discussion rests upon the simplification of the mathematical calculations required through the introduction of a universal analytical expression of geometrical quantity for the surrounding walls.—*Journal of the Institute of Electrical Engineers of Japan*, March, 1928.

Miscellaneous

Investigations of Lightning. — L. BINDER.—If the time of a lightning discharge is known, the current intensity can be calculated from calorific actions on wires or cables. Based upon past and recent observations, the author establishes a formula for the current to be $i = 9{,}500/\sqrt{t}$, giving values which check closely with Peek's latest observations on steel springs, melted by lightning. Measurements on the duration of discharge were made formerly with revolving cameras, while more recently oscillographic, cathode-ray and klydonograph records have afforded a much higher accuracy. Another method used by the author required a series of graduated spark gaps, finding in every case a total duration of more than 1/100 second. During these tests it was found that the distance of the thunder cloud not only affects the induced voltage but that it has also a decided influence upon the time character of the recorded phenemenon, which means that observations on the ground fail to indicate actual lightning conditions. — *Elektrotechnische Zeitschrift*, March 29, 1928.

News of the Industry

Transmission and Transportation

Developments in These Departments of the World of Power Attract Main Attention at New Haven A.I.E.E. Meeting —Attractive Itinerary of Inspection Trips

NEW HAVEN gave a royal welcome this week to the fifth annual regional meeting and student convention of the Northeastern District of the American Institute of Electrical Engineers, which opened Wednesday morning at the Hotel Taft with a large and enthusiastic attendance. Nineteen papers composed the major business program, and through the courtesy of the New York, New Haven & Hartford Railroad a fine inspection itinerary was provided for delegates and guests, including the recently installed mercury-arc rectifier substations of the Connecticut Company at Bridgeport and Stratford, frequency-converter substations of that company and the Connecticut Light & Power Company at Devon and New Haven, the mercury boiler and turbine under erection for the Hartford Electric Light Company, the Hartford hump yard of the New Haven road, and the Rocky River hydro plant of the Connecticut Light & Power Company at New Milford. Yale University kept open house, and through the courtesy of the department of drama a party was scheduled for Friday evening in the Yale University Theater.

At the opening session on Wednesday morning four papers on transmission and four on measurements were presented. An active discussion of these papers was held in the afternoon. Commenting upon the paper of Philip Sporn, which dealt with the rationalization of system insulation, J. L. Montsinger urged that the 60-cycle flashover value of an insulator disk be used as a yardstick to specify the insulation strength of a transformer. C. L. Fortescue, in discussing this paper, stated that any lightning surge exceeding the 60-cycle flashover value for a fraction of a second would result in flashovers. In his opinion, high-impulse ratio values in line insulation did not indicate immunity from lightning flashovers. In endeavors to reduce line outages he urged the use of ground wires in preference to the brute-force method of adding insulation.

J. F. Peters said he was in favor of co-ordinating system insulation, but that the method advocated by Mr. Sporn was not feasible because insulation values are variable and, as designed, there was insufficient leeway in fixing insulation steps. He thought it would be better to fix one weak insulation point in the system, preferably near terminal equipment. In discussing a paper by W. W. Lewis, which also dealt with line insulation, Mr. Peters said that the ground-wire theory was based on induced strokes, but it was not yet proved that it would be effective on chopped waves resulting from direct strokes.

F. W. Peek discussed these papers and said that the maximum voltage that reaches terminal equipment is the arc-over voltage of the line insulators. When line insulation is increased it is therefore reasonable to increase the insulation strength of terminal apparatus to give the corresponding increased system service.

Closing the discussion, Mr. Sporn said that there was no reason for using insulator flashover values as yardsticks to measure transformer insulation strength. It would be better to specify test waves and use numerical values.

Instrumental measurements of surge effects were featured in papers by C. I. Hall, E. M. Tingley, J. W. Legg and A. F. Hamdi and H. D. Braley. Marked improvement in oscillographic technique was evidenced by these papers. At a technical session Wednesday afternoon papers were presented on railway motor selection, track-circuit shunting, the diverter-pole generator and electric conduction in hard rubber, pyrex glass and quartz.

Various aspects of the supply of power for heavy traction service were covered in five papers presented at a railroad power session Thursday morning. Friday was to be given to a student branch session, inspection trips and an afternoon session on power developments, with special emphasis upon the mercury boiler and Rocky River, by L. A. Sheldon and E. J. Amberg respectively. The annual regional banquet was scheduled for Thursday evening, and the convention was to close with a trip to Rocky River on Saturday. Attractive entertainment was provided.

Chamber of Commerce for Teamwork

Main Theme of the Washington Meeting, Where Special Attention Is Paid to Light and Power—Sloan and Pack Speak— R. E. Norton on Power and the Investor

THE sixteenth annual meeting of the Chamber of Commerce of the United States was held in Washington on May 7 to 11. "Teamwork for Prosperity" was the subject of the meeting, which focused attention on present and coming economic currents in the nation's business life and on organized efforts to interpret them.

Sounding the keynote at the opening session on Tuesday morning, Judge Edwin B. Parker, chairman of the chamber's board of directors, declared that unless business purge itself of those "whose acts stigmatize and bring business generally into disrepute," the public will turn loose "thunderbolts of wrath" which will inevitably bring legislative and governmental regulation of business and hamper freedom of initiative. Judge Parker's indictment of those who exploit the public for their private gain was the high light of the session. He reiterated the chamber's opposition to government in business, branded as "business outlaws" those who fail to observe the canons of decency and fair play, called for co-operation in the interest of agricultural prosperity, and warned against flaunting American prosperity before the rest of the world instead of dedicating such prosperity to service.

Three addresses of special interest to the electric light and power industry, because of their bearing on the present legislative situation and also because of their interpretation of the industry to business, were delivered at the session of the Natural Resources Division on Tuesday afternoon. M. S. Sloan of Brooklyn, chairman of the division, told of the conditions and trends in the development of forests, minerals and water, stressing some of the social aspects of natural resources.

Touching water-power development, he said in part:

Government ownership and overregulation threaten all industries dealing directly with natural resources. Water resources, however, have received the bulk of legislative attention, both state and federal. Numerous attempts are being made to break down our national water-power policy through special legislation which would take major power projects out of the established federal water-power policy and treat them as special projects. Muscle Shoals establishes a precedent for the demand for special consideration in numerous instances. It is a demand for special consideration of the power features of the Colorado River and the Boulder Canyon project that has complicated the issues and delayed much-needed flood prevention measures. The settlement of power questions on the St. Lawrence River development is delaying the settlement of that great international question. The problem does not stop with any individual project. Attempts are being made to consider the whole Ten-

nessee River apart from our national water-power policy because of its relation to Muscle Shoals. And proposals are being made to inject into interstate compacts certain agreements that would bind the whole resources of the Colorado River to the special policy which it is proposed to set up for the Boulder Canyon project. Comparable situations have arisen in projects on the Columbia River. Over one-half of the nation's water resources are today bound hand and foot by legislative proposals and must await the final outcome of these proposals before any development can take place.

The practice of making political capital of this natural resource must end. No reason has become apparent for abandoning the water-power policy which was so laboriously created. In an industry such as the power industry where capital investment is great and where money turnover is slow nothing can be more prejudicial to success than the shifting sands of a changing national policy.

To stimulate a more careful use of natural resources it is not necessary for the American people to engage in business activities through government agencies. Neither is it advisable for them to adventure in government ownership for the purpose of demonstrating how development should be conducted and at what price the product should be marketed. The experiences in government operation give us no occasion for pride.

Group Management

R. F. Pack, vice-president and general manager Northern States Power Company, Minneapolis, spoke on teamwork and group management. Part of his remarks follow:

A really thorough analysis of group management reveals that it is built primarily on its ability to select the best-qualified individuals from this great aggregation of human beings, organize them and put them to work for the benefit of all of us. To some "group management" suggests holding companies, and holding companies in turn suggest some remote organization of selfish financiers devoting their energies to pyramiding profits and enriching themselves at the expense of the public. While there are opportunities for abuse in the group management field as there are opportunities for abuse in every other form of business, the fact is that group management is fundamentally and economically sound in that it provides for organizing and utilizing the best available human ability to operate the best machinery ever devised in the industrial history of the world.

Group management is neither new nor peculiar to the electric light and power business. It exists in one form or another in the field of agriculture and related industries, mining and quarrying, manufacture of food products, of textiles, leather and leather products, rubber and rubber goods, metal and metal products, in the amusement business, the hotel business, retail merchandising and in other lines of business activities. In fact, it is being more and more recognized as the soundest and most logical means of rendering the best possible service to the public at the lowest possible cost.

The suggestion that group management is founded primarily on the organization and utilization of the best available human ability and that this method of operation accomplishes material benefits to the public can be amplified by a consideration of the public utility field.

Not many years ago there were numerous communities which had no electric service at all, and in others it was very inadequate. Good service was obtainable, for the most part, only in the large population centers. In that day each community was served by an individual generating plant built for that purpose. Then came advance in the art of transmitting electricity, with consequent interconnection of steam and hydro generating stations, and in the interconnection of groups of towns each drawing from a common power pool. That was the first step toward group management. It accomplished economies which are now too generally known to need further discussion.

The next step was the formation of holding and management companies which undertook to operate and direct a number of these interconnected systems, located often in widely separated parts of the country. Under this plan of organization hundreds of communities ranging in size from large cities to the smallest crossroad villages are given the benefit of the highest type of managerial skill. After all, isn't it good management which marks the line between success and failure in business? It is not the kind of business that makes that business a success. If that were true, everybody would enter that particular line of business with assurance of success. The thing that makes any business a success is its management. The group management plan of operation of public utilities not only furnishes the highest type of management which can be obtained, but the best available brains in each specialized field. For example, the highest obtainable type of hydraulic engineer is employed. It is his job with other duties to inspect and test waterwheels. The importance to the ultimate consumer of this work is quickly seen when we realize that a loss in waterwheel efficiency of 3 per cent may be equivalent to a loss of 2,500,000 kw.-hr. per year in a hydro-electric plant of 20,000-kw.-hr. capacity.

Group purchases mean concessions in prices. A group management company buying in volume for many properties is able to obtain prices fully 10 per cent lower than those which can be made available to an isolated plant. The significance of this may be appreciated when it is known that one large group company may purchase during the year as much as $30,000,000 worth of materials and supplies.

It is in the field of financing, however, that holding-management companies are able to render the most conspicuous service to the members of their respective family groups. Investment bankers and big and small individual investors scrutinize carefully the public utility seeking capital. They both insist that the company must be either one of considerable size or be associated with a larger group, that its earnings and expenses be about normal, that its property be well maintained, that the securities in which capital is to be invested be so adjusted that they are fairly protected by property and earnings, that the company be well managed and have good future prospects. The group properties come nearer to meeting these demands than do individual plant companies. This is evidenced by the fact that they are able to finance at a uniformly lower rate, which, after all, is the best evidence of their stability.

It will be seen, then, that group management not only accomplishes material saving in dollars and cents, which is being passed along to the ultimate consumer, but it makes available to the smallest community the best brains and the highest type of skill that can be obtained, to the material benefit of the public served.

Speaking of teamwork, Mr. Pack reviewed the work of the electric light and power industry with agricultural colleges and farmers on farm electrification and with the telephone companies on inductive co-ordination. He went on to say:

These examples of teamwork give us pleasurable thrills, but unfortunately we do not always get teamwork in business. There are many forces in this country which are busy night and day, stirring up suspicion and discontent and endeavoring to promote radicalism and indeed socialism in every form. Public ownership is a favorite medium. It happens just now that there are pending in Congress a number of measures which would put the government into the electric light and power business. We appreciate that it is our chestnuts which are in the fire. It is our industry which is immediately threatened, and we are doing the best we can to keep the government out of the electric business, because we consider it the legitimate field for private enterprise.

The United States government already is engaged in various lines of business which by no stretch of the imagination can be considered legitimate governmental functions. Some of our states are in the banking business, flour-milling business, cement business, insurance business and so forth. The municipalities own and operate gasoline stations, coal and wood yards and what not. There is a call here for team work. There is an opportunity for every business man who believes that government, whether national, state or municipal, should refrain from competition with legitimate business enterprise to consider the trend of the times, realizing that his business may come next and that here is a real and direct call for teamwork.

Financing Utilities

R. E. Norton, vice-president C. H. Geist Securities Corporation of Philadelphia, discussed electric power and the investor. After a brief excursion into the history of electrical financing, he said:

Prior to 1920 the limited or "closed" mortgage was the only instrument considered conservative. On account of the immense growth of the electrical industry, large sums of money were required, and it soon became apparent that the limited mortgage restricted growth; hence the "open-end" mortgage. At first this mortgage was coolly and pessimistically received; but as time passed, owing first to the restrictions of the mortgage and second to the practice of electric companies, through customer ownership and otherwise, to sell their common and preferred stocks and preserve their junior equities, mortgages of this kind were accepted by the most conservative institutions.

For this reason I believe the mortgages protecting the electric utility securties are more conservative than those that protect either the industrial or the railroad issues in the United States. At first the investor cared and knew little about the mortgage restrictions; but now, as a general rule, the mortgages securing power and light securities are filed, inspected and studied by the large purchasers of bonds, as well as by the insurance companies.

And now consider the psychology of the investor. He has found a security regulated by the state public service commissions—a security in which the gross and net earnings of the properties continue to in-

crease in a steady line, good times and bad; a security protected as a rule by sound mortgages and based on management that shows the highest sort of progressiveness and efficiency. These are the factors that have brought about his conversion.

I remember well the thrill that went through the banking world when, about 1923 or 1924, it was newsed about that the life insurance companies in New York were buying power and light bonds. Less than a month ago such bonds, under certain restrictions, were made legal for New York savings banks. Today electric utility bonds of proper character are being purchased at prices approximately on the same basis as you will find in railroads or other securities of the highest class. The markets are active, and many of the securities are listed on the New York Stock Exchange and other exchanges. There is a demand for the preferred stocks and a strong demand for the common stocks. The demand is based not only upon present earnings, but on future; and it is impossible to say that we have reached a point where the power and light properties, both in efficiency of operation and in popularity with the investor, have come into their own.

An interesting forecast of the probable future trend of taxes, and especially corporation taxes, in the next ten years was made at the Wednesday afternoon session of the Finance Department by Prof. Thomas S. Adams of Yale University. He contended that the burden of taxation on corporations is too high and should be reduced to the actual requirements of the sinking fund. Taxes in the aggregate, he believed, will increase, owing to increased governmental expenditures; but he said they should be more justly apportioned among corporations and individuals. A corporation tax of 10 per cent would in his estimation be more equable and not necessitate raids on the present sinking fund.

Douglas Attacks Los Angeles Bureau

Representative from Arizona Says that City Had up to 1925 Spent Nearly $130,000 for Boulder Dam Propaganda— Other Testimony Before Trade Commission

THAT the city of Los Angeles through its Bureau of Light and Power had expended more than $129,000 up to the year 1925 to influence public opinion and the Congress in favor of Boulder Dam was the accusation made before the Federal Trade Commission on Wednesday afternoon of this week by Congressman Douglas of Arizona. In Congressman Douglas' opinion the actual sum spent to date was four times that amount in addition to gifts of oranges and other fruit to members of Congress.

Congressman Douglas' testimony followed that of George F. Oxley of the National Electric Light Association, Judge Davis and Ira L. Grimshaw of the Joint Committee of National Utility Associations and Fred J. Bollmeyer of Cleveland, director of the Ohio State Committee on Public Utility Information. Following Congressman Douglas came Benjamin E. Ling, former director of the Ohio committee, and D. L. Gaskill, secretary-treasurer of the East Central Division of the N.E.L.A. The testimony of these witnesses was similar to that inserted in the record by the other state committees on public utility information.

Congressman Douglas' testimony created quite a sensation in an otherwise drab hearing; so much so that the full commission will consider it with a view to determining whether his testimony comes within the scope of the Senate resolution. Up to the present the Federal Trade Commission has been proceeding on the theory that the investigation was limited to privately owned electric light and power and gas corporations.

Congressman Douglas submitted that, in view of the activities of the city of Los Angeles, through the use of its great political power with relation to the inhabitants of the Owens and Santa Clara Valleys in California, and in view of its activites in expending huge sums of money to influence public opinion and members of Congress to support federal ownership of a tremendous power project, the conclusion is inevitable that the activities by political subdivisions to influence public opinion can be as insidious and as dangerous to the body politic as can be the activities of any other type of organization.

As a part of the record Congressman Douglas filed copies of resolutions passed by the Public Service Commissioners of Los Angeles calling for appropriations to the Boulder Dam Association. The Reclamation Service received $120,000 from Los Angeles and affiliated agencies for the investigation of the Boulder Dam site. More than $19,570 was received by the Boulder Dam Association up to July 19, 1924. Other contributions were read into the record, Congressman Douglas giving amounts and dates. He also called attention to the appropriations of the Imperial Valley Irrigation District, totaling $109,807. One item called for a fair-sized appropriation for the purpose of conducting a Congressional party through Imperial Valley. In addition, a special train came to Washington in 1927, carrying lobbyists for the Boulder Dam bill.

Speeches made throughout the country in favor of Boulder Dam were cited as evidence of propaganda by municipalities, and attention was directed to the great number of Californians now in Washington lobbying for the Boulder Dam bill. The Board of Supervisors of Los Angeles County also appropriated $20,000 in May 3, 1928, for that purpose. On the strength of the showing made Congressman Douglas suggested that the Federal Trade Commission investigate further into the activities of Los Angeles.

Pennsylvania Activities

When Walter E. Long, who is treasurer of the public policy committee of the Pennsylvania Electric Association, took the stand at the Federal Trade Commission's inquiry into the public utilities on Thursday, May 3, he testified that the Pennsylvania Electric Association derived its revenues from the National Electric Light Association, which, he said, rebates part of the dues paid to it by Pennsylvania utilities. The public policy committee's funds come directly from member contributions. This committee was organized eight years ago to function in an advisory capacity on all matters dealing with general policies of the industry in Pennsylvania.

Mr. Long testified that in recent years there has been no active campaign against municipal ownership in Pennsylvania. The public policy committee, he said, was interested mostly in matters before the state departments and before the Legislature at Harrisburg. Its interest is explained by its obligations to its member companies. It had expended $113,000 since 1922.

Judge Healy, the examiner, asked Mr. Long to identify nine items totaling approximately $20,000 paid from September, 1922, to March, 1928, to the chairman of the committee, Walter H. Johnson. Mr. Long said he understood this money was used by Mr. Johnson for "attorneys and agents" but could not say for what particular purposes, preferring to have Mr. Johnson answer. He admitted the opposition of his committee to Governor Pinchot's "giant power" bills. Attorneys' bills of more than $14,000 each to two Philadelphia legal firms were shown, as well as the payment of $1,000 each to a former state legislator, W. T. Mamsey, and to J. H. Bigelow, chairman of the State Democratic Committee.

Governor Pinchot's attitude partly led to the determination of the Pennsylvania Electric Association to intensify its public relations campaign, Mr. Long admitted. He denied that the association or any of its member companies owned or held the obligations of any newspapers, and he replied in the negative to questions whether they had contributed to a presidential or senatorial campaign.

Mr. Johnson followed Mr. Long. He said he could not recollect what he had done with the $20,000 turned over to him by Mr. Long. "But I can say that not a penny of it was spent in connection with public or municipal ownership," he stated. "Every cent of it was spent honorably and lawfully." He thought some of it went to pay persons engaged to oppose bills at the state capital.

A. G. McKenzie of Philadelphia, director of the state utilities information bureaus of Pennsylvania and New Jersey, testified as to the publicity activities of these bureaus, and A. B. Millar, managing director of the Pennsylvania Elec-

tric Association and of the Eastern Division of the N.E.L.A., testified that he had held his present office for only about six months and had been spending most of his time studying the duties and functions of the association.

Documentary evidence, mostly relating to surveillance maintained by public utilities over textbooks on economics used in the schools and colleges of Pennsylvania, was introduced on Thursday. Most of the data were taken from files of the former director of the Pennsylvania Public Service Information Committee, Major Richardson, who is now director of information of the Joint Committee of National Utility Associations.

On Friday Senator Norris declared from his seat that the investigation is revealing "most startling things" as to the methods used by the utility interests to educate public opinion. He referred specifically to efforts to influence the adoption of public school textbooks and to defeat government power projects.

Hunt Attacks Methods of Boulder Dam Boosters

Governor of Arizona Wants Two-Sided Investigation, Asserting that Five Dollars Has Been Spent to Further Scheme for Every Dollar Spent Against It

DEMANDING that the Federal Trade Commission shall investigate moneys expended and publicity methods followed by the friends as well as by the opponents of the Swing-Johnson bill, Governor G. W. P. Hunt of Arizona, whose stand against the bill and seven-state treaty has been repeatedly indorsed by re-election to the chief magistracy of his state, makes the charge in a letter to the commission under date of May 2 that "there is a conspiracy to rob the State of Arizona of valuable resources, to make them available to power companies in the State of California, and that enormous sums of money have been and are being expended to employ lobbyists, lawyers, engineers and newspaper men, and to pay for propaganda; that methods—both legitimate and questionable—have been employed to influence public opinion and to influence members of Congress in favor of the Boulder Dam legislation and to threaten, intimidate, harass and browbeat members of Congress into supporting the Boulder Dam legislation," and that "it could also probably be established that attempts have been made to influence the policy of candidates for the office of President of the United States."

Among other things the Governor says:

> Many of these newspapers articles, by inference and innuendo, charge that the State of Arizona in opposing the Swing-Johnson bill is acting in collusion with and under the influence of the representatives of private power companies. These allegations I challenge, denounce and deny. I am, of course, familiar in a general way with the "evidence" which has been offered to sustain the charges with reference to the alleged activities of the power companies. I am also familiar in a general way with some of the propaganda broadcast by those who are advocating this Boulder Dam legislation, and it is my belief that for every dollar the opponents of Boulder Canyon legislation have spent in opposing it those supporting the legislation have spent five dollars.

Governor Hunt appended to his letter a list of persons—not made public—whom he suggested that the Federal Trade Commission summon for examination on this phase of the matter.

Power Board Considers Indian Power-Site Claims

The staff of the Federal Power Commission has recently completed a study of the amount, if any, that should be paid the Apache Indians of the San Carlos reservation in consideration of the development of power at the Coolidge Dam in Arizona. The dam is being built by the irrigation division of the Indian Service for the purpose of providing a dependable water supply for the Pima Indians and other users in the Gila Valley above the mouth of Salt River.

The Interior Department appropriation act provides for the generation of power at the dam as a by-product of the development. It also calls upon the Federal Power Commission to report to Congress whether any payment should be made to the Apaches as compensation for the power. Those who have been following the study are not surprised at the commission's report that the Indian lands had no power value independent of the irrigation development and that as the Apaches will benefit from the availability of power at low rates for their own pumping and domestic purposes no further compensation should be made.

A declaration of intention has been filed with the Federal Power Commission by the Fox River Paper Company in connection with its plan to reconstruct the dam across the Wisconsin River at Appleton.

Middle West N.E.L.A. at St. Louis

More than three hundred delegates to the sixth annual convention of the Middle West Division, N.E.L.A., assembled at St. Louis on Wednesday for a three-day session. A notable address by President Don M. Sterns defending the merger movement, a plea of Chairman J. F. Owens of the Public Relations National Section for fuller appreciation of service on association committees, an able treatment of the rural service question by F. J. Hanlon of Mason City, Iowa, and a defense of utility organization and publicity by Carl D. Jackson were the outstanding events on the first day's program. The ELECTRICAL WORLD's report of the meeting will appear next week.

Fighting Over Power Bills Goes on at Capitol

Muscle Shoals Bill Warmly Debated in House, Which Adopts Radical Amendment—Boulder Dam Delay—Flood Prevention Bill Compromise

CONSIDERATION of the Muscle Shoals bill on May 9 indicated that the House is almost equally divided on the measure. Despite a desperate effort on the part of the proponents of the bill to prevent it, the House voted by 169 to 159 to adjourn. The bill had been brought up on calendar Wednesday and was automatically displaced on the following day by the regular order of business. Unless a special rule be granted, it will not be brought before the House again before Wednesday of next week.

An amendment adopted in the course of the debate makes the bill more radical than ever. It provides that the Federal Power Commission is to determine the rate of any resale of power to the ultimate consumer. Thus, in addition to setting up the government in two lines of commercial business—fertilizer manufacture and the generation of electrical energy—a direct conflict between the rate-making bodies of the states and of the federal government is brought about.

The measure is regarded as one of the most radical ever brought to such an advanced legislative stage in the history of Congress. Representative Garrett, the minority leader, pointed out, in an impasstioned speech, that "for the first time in all the history of the country it is deliberately proposed that the federal government shall go into business for business' sake." The House, however, voted down by 125 to 46 Mr. Garrett's amendment that the government corporation be subject to local taxation and other laws of the states in which it operates to the same extent as would a private corporation engaged in such enterprises. Another important feature of the action taken by the House was the placing of a one-hour limit on all debate.

The National Fertilizer Association is protesting loudly against the failure of the military affairs committee to grant it a hearing.

No little encouraged by an indorsement from the White House and by the inclusion of their legislation on the tentative program of the House, advocates of the Boulder Dam bill conferred May 8 with Majority Leader Tilson in the hope of making arrangements for early consideration of the measure. Mr. Tilson took the position that the House should await the action of the Senate, where the Boulder Dam bill is the unfinished business. This is not satisfactory to the supporters of the bill.

Alterations in the flood prevention bill have been made to meet some of the President's objections to it in the form in which it was originally passed. As amended, it has been accepted by both houses and is expected to have Mr. Coolidge's approval. It appropriates $325,000,000.

Purchases and Mergers

Hodenpyl-Hardy and Stevens-Wood Interests Are Consolidated—Arkansas Power & Light Takes Over Southern Edison, Ending Litigation

IT WAS announced on May 7 that the Allied Power & Light Company has been organized to consolidate the interests of Hodenpyl, Hardy & Company, Inc., and Stevens & Wood, Inc. The new company has contracted to acquire substantial stock interests in the Commonwealth Power Corporation, the Northern Ohio Power Company, the Penn-Ohio Edison Company and other companies. Hodenpyl, Hardy & Company were organized in 1914 and with their predecessors have for more than thirty years been interested in the organization, development and operation of public utility properties. Many of such properties—including the Consumers' Power Company, the Tennessee Electric Power Company, the Central Illinois Light Company, the Southern Indiana Gas & Electric Company, the Illinois Power Company, the Ohio Edison Company, the Illinois Electric Power Company and the Southern Michigan Light & Power Company—are now component parts of the Commonwealth Power Corporation system. Stevens & Wood have for many years engaged in the general engineering and construction business and the managing, supervising and financing activities of public utility corporations. They will continue business as a subsidiary company. Mr. Hodenpyl and Mr. Hardy will have substantial investment interests in the Allied company, but will not actively participate in its operations. B. C. Cobb is chairman and R. P. Stevens is president.

By a million-dollar deal completed April 30 the entire capital stock of the Southern Edison Company was transferred to the Arkansas Power & Light Company by the People's Light & Power Corporation of New York, of which the Southern Edison is a subsidiary. All plants and property of the Southern Edison in Arkansas and Mississippi pass into the control and management of the Arkansas Power & Light Company. The transaction will result in the dismissal of an appeal pending in the state Supreme Court, taken by the Southern Edison Company from the judgment of the Independence County Court at Batesville, Ark., regarding ownership of the electric light and water plants at that place and involving $425,000. (See ELECTRICAL WORLD, May 21, 1927, page 1081). The Southern Edison Company has withdrawn its bid for this property. Included in the transfer is the dam across Big Creek near Pangburn, 14 miles from Searcy, Ark., begun by predecessors of the Southern Edison, and which was almost destroyed by the floods last year.

Stockholders of the Harrisburg Light & Power Company will vote June 25 on whether to sell their holdings to the Pennsylvania Power & Light Company. Both companies are controlled by the Lehigh Power Securities Company.

The Harlem Valley Electric Corporation of Pawling, N. Y., has filed a certificate in the office of the Secretary of State of New York merging the Carmel Light & Power Company. The New York State Electric Corporation of Ithaca, N. Y., has filed a certificate merging the Tusten Light & Power Company. The New York Power & Light Corporation, Albany, N. Y., has filed a certificate merging the Blue Hill Light & Power Corporation. The Eastern New York Electric & Gas Company, Mechanicville, N. Y., has filed a certificate merging the Bouquet Electric Power Company.

The Ohio Public Utilities Commission on May 3 authorized the sale of the Union Gas & Electric Company to the Cincinnati Gas & Electric Company for a consideration of $9,695,778, to be paid with the issuance to the former of 185,000 shares of common capital stock at a declared value of $52.40 per share. The Cincinnati Gas & Electric Company, like the Union Gas & Electric, has been under lease to the Columbia Power Company, a subsidiary of the Columbia Gas & Electric Company. As previously announced, the subsidiary properties will be consolidated as the Cincinnati Gas & Electric Corporation.

The Commonwealth Telephone Company of Chicago has asked the Missouri Public Service Commission to approve its purchase of the Holt (Mo.) Electric Light Company.

Calera, Okla., voted April 30 to sell its city-owned lines and distribution system to the Oklahoma Gas & Electric Company.

After several elections in which proposals to sell the Westville (Okla.) municipal plant were voted down, that town on April 24 authorized sale of the plant for $45,000 to W. C. Tegtmeier and associates of Davenport, Iowa. The vote was 183 to 6.

The Town Council of Hooker, Okla., has accepted the bid of the Inland Utilities Company for its municipal light and power plant subject to confirmation at a special election.

Action taken by the City Council of Tahlequah, Okla., to hold an election on an offer to purchase the city lighting plant for $130,000 cash and "other considerations" has met with opposition from citizens who oppose the sale of the plant or favor another bid, stated at $175,000, and they have appealed to the Governor to interfere.

Oscar Nelson, who has owned and operated the Essex (Iowa) Light & Power Company 28 years, has sold the plant to the Nebraska-Iowa Power Company.

Purchase of the holdings of the Texas-Gulf Power Company by the Texas-Louisiana Power Company, which has its headquarters at Fort Worth, Tex., is announced by A. P. Barrett, president of the latter company. The transaction involves the electric light and power plants at Texas City, Friendswood, League City, Dickinson, Brazoria, West Columbia, Angleton and Strawn, as well as the Wichita Falls Traction Company and some waterworks, ice and gas plants. The consideration was not made public. The Texas-Louisiana Power operates in Texas, Louisiana, Oklahoma, New Mexico, Arizona and Kentucky.

The City Council of Summit, Miss., has voted to sell the local electric light plant and franchise to the Mississippi Light & Power Company for $22,500.

The Northern Electric Company has purchased the Whitewood Power & Light Company's plant at Whitewood, Saskatchewan. This firm has also purchased several other plants in eastern Saskatchewan and will operate them from a central producing plant. The town of Fillmore, Saskatchewan, has sold its municipal power plant to the Montreal Engineering Company.

Prescott Host to Arizona Utilities Convention

First Meeting of Newly Organized State Body Proves Highly Successful from Both Business and Entertainment Viewpoints

THAT the Arizona Utilities Association's annual convention and joint meeting with the Pacific Coast Electrical Association and the Pacific Coast Gas Association, held at Prescott, Ariz., April 26, 27 and 28, in the Hassayampa Hotel, was the best all-around convention to meet in Arizona up to date was the way old convention heads expressed themselves regarding the gathering. With a record attendance of 125 delegates from Arizona, California, Colorado, New Mexico and Texas and an unusually good program, the success of the first convention of the newly organized association was called overwhelming.

On the opening morning President W. C. Hornberger outlined the history of the association, its work and its hopes. A talk on the development of the Salt River Valley by Jasper S. Connell of the Salt River Valley Water Users' Association, in which he outlined the program for irrigation and electrification of the valley, followed. Mayor E. C. Seale and M. A. Pooler of the Tucson Gas, Electric Light & Power Company spoke at the luncheon, and in the afternoon W. L. Frost, president Pacific Coast Electrical Association, made an enlightening talk on "The Commercial Era."

On Friday morning A. R. Baily, Los Angeles Gas & Electric Corporation, read a paper on "Practical Present-Day Distribution Methods" in which he outlined some experiments made by his company. S. R. Knight of the same company took as his topic "Some Applications of Recent Developments of Steam Power Generation" and described, using colored charts, modern methods of obtaining the most kilowatts per unit of fuel. P. G. Spilsbury, president of the Arizona Industrial Congress, spoke on "Public Relations," advising that the public be informed of all activities in easily understandable terms.

The four best essays selected from those submitted in a recent employees' essay contest were read. The winner was Mrs. Jean Roberts of the Tucson Gas, Electric Light & Power Company.

At the evening banquet on Friday a Smoki Indian snake dance provided a novel feature and was accompanied by other enjoyable performances. On Saturday morning the delegates were guests of the United Verde Copper Company at the Jerome-Clarkdale mines and smelter.

Officers elected for the ensuing year are: President, M. A. Pooler, Tucson Gas, Electric Light & Power Company; first vice-president, L. V. Seares, Arizona Power Company, Prescott; second vice-president, A. F. Moriarty, Central Arizona Light & Power Company, Phoenix; executive secretary, Milton G. Sanders, Phoenix.

Ontario Hydro Rates Raised at Toronto

About eighty-six thousand users of electricity in Toronto have been called upon to pay more for their power and light by reason of an upward adjustment of rates announced by the Hydro-Electric Power Commission of Ontario. On houses of six or seven rooms the increase is about 14 per cent, while in the larger homes of ten or twelve rooms the boost is about 29 per cent.

The minimum rate is now 1½ cents per kilowatt-hour, with 10 per cent discount for prompt payment, compared with 1 per cent per kilowatt-hour, with the same discount, the rate which prevailed for some years. Moreover, consumption in excess of 9 kw. per 100 sq.ft. of floor area will cost 2 cents per kilowatt-hour for the excess consumption, except where consumers use electric cooking ranges, when an additional 200 kw. will be allowed at the 1½-cent rate.

The announcement intimates that the revision upward has been necessary because domestic consumption has passed beyond the limits of offpeak supply. The "object of the adjustment," continues the announcement, "is not so much to collect more revenue from the customers who are using an amount of power comparable with what they used in 1916 as to correct the tendency toward increasing loss which results from larger and larger consumption of excess power sold at a decreasing average rate with an increasing average cost."

The new rates are as follows:

Floor area charge, as at present, 3 cents per 100 sq.ft. per month.

First 3 kw.-hr. per 100 sq.ft. of floor area per month, as at present, 2 cents per kilowatt-hour.

Next 6 kw.-hr. per 100 sq.ft. of floor area per month, 1½ cents per kilowatt-hour.

Consumption in excess of 9 kw.-hr. per 100 sq.ft. of floor area per month at 2 cents per kilowatt-hour, subject to an allowance to customers having electric ranges of an additional 200 kw.-hr. per month at 1½ cents.

Prompt payment discount—One cent per 100 sq.ft. of floor area per month.

Refrigerator Manufacturers Organize New Council

Commercial officials of the leading manufacturers of electric refrigerators held a meeting at the Detroit Athletic Club on Wednesday to discuss the advisability of perfecting an organization to promote their common interests. There were present representatives of the Kelvinator, General Electric, Servel, Copeland, Climax, Norge, Dole, Peerless, Zerozone, General Necessities, Cleveland Iceless Cooler and Ice Master companies. The meeting was held at the invitation of A. E. Waller, managing director of the National Electrical Manufacturers' Association, to consider the advisability of forming a refrigerator section of the Appliance Division of the N.E.M.A. rather than organizing a small independent association.

Interest in the discussion focused upon the immediate concern of the manufacturers to bring about more harmonious policies in the education of the public to the advantages of mechanical refrigeration by discouraging destructive practices in competition, and also upon the guidance of proper forms of local regulating ordinances governing the installation of refrigerating equipment. Organization was also seen to offer further opportunities in the field of standardization, industry statistics and similar group activities.

The conference finally voted to form a Refrigeration Manufacturers' Council and tentatively to indorse the N.E.M.A. proposal. The new organization will become effective when ten members sign the constitution and bylaws, which are slightly modified from those prepared after the Walden Woods conference of some time ago. Officers were elected as follows: President, C. K. Woodbridge, Kelvinator Corporation; vice-president, T. K. Quinn, General Electric Company; secretary, G. W. Mason, Copeland Products, Inc.; treasurer, H. E. Blood, Norge Corporation. The directors will be these officers and E. B. Mallory, Climax Electric Refrigerating Company.

Tablet to Coffin Unveiled

IN THE presence of more than ten thousand employees, the board of directors and a few invited guests, a finely executed bronze tablet honoring the memory of Charles A. Coffin, founder of the General Electric Company, was unveiled at 12:35 p.m. on Tuesday, May 8, at the main gate of the Schenectady plant of that company. At that hour, after music by the General Electric band, Owen D. Young, chairman of the board of directors, called upon Miss Alice Coffin, daughter of the former president, to lift the curtain covering the tablet. E. W. Rice, Jr., honorary chairman of the board, then spoke, paying tribute to the genius, courage, public spirit, modesty and consideration for others that characterized Mr. Coffin.

Southwestern Public Service Association at Dallas

May 2 to 5 was the date of the thirty-third annual convention of the Southwestern Public Service Association, held at Dallas, with general sessions each morning and meetings of the electric, railway, gas and accounting sections in the afternoons.

After the formal welcome and response on the first day, by E. H. Kifer, vice-president San Antonio Public Service Company, and President M. T. Walker of the association respectively, Secretary E. N. Willis gave an account of the year's accomplishments. Some of the speakers at the general sessions on the following days were John D. Liston of the General Electric Company, J. F. Owens, chairman Public Relations Section, N.E.L.A.; Managing Director Clapp of the N.E.L.A., and Miss Thelma Robinson of the Dallas Power & Light Company, Texas winner in the prize speaking competition, who took for her subject "The Electrocution of Drudgery."

The subjects considered at the meetings of the Electric Section comprised increasing the domestic load, refrigeration, organizing for service to large power customers, safety methods, rural electrification and the selection and training of employees.

More than five hundred men attended the convention. W. H. Burke, Fort Worth, Tex., Southwestern district manager for Stone & Webster, was elected president of the association for the ensuing term.

Society of Arts and Sciences Awards Medal to Edison

The gold medal of the Society of Arts and Sciences has been awarded to Thomas A. Edison and will be presented to the distinguished inventor at a dinner to be held at the Hotel Astor, New York, on Thursday evening, May 24, at 7 o'clock. Helen Knox, executive secretary of the society, will preside, and the chief speeches will be made by Dr. John Campbell Merriam, president Carnegie Institution of Washington, and Dr. Elihu Thomson. Others who will be called upon are President James R. Angell of Yale, Dr. John H. Finley, Dr. Frank B. Jewett, Charles F. Kettering, Jesse L. Lasky, Secretary Howard McClenahan of the Franklin Institute, Dean William F. Russell of Teachers' College, Columbia University; Prof. Harlow Shapley of Harvard, President S. W. Stratton of the Massachusetts Institute of Technology, Dr. Willis R. Whitney and Arthur Williams. Reinald Werrenrath will sing, and "ether music" will be demonstrated by Prof. Leon Theremin.

Mr. Edison, in accepting the award, requested that should the state of his health at the time of the dinner make it impossible for him to come from Florida, the society permit his son, Charles Edison, president of the Edison Industries, to accept the medal for him.

Storms Wreck Lines

Penn Central Light & Power Company, Hard Hit by Belated Blizzard, Recovers Rapidly, Aided by Neighboring Utilities—Trouble in Nebraska

AMONG light and power companies whose transmission systems were damaged by belated winter storms as April gave place to May the hardest hit was the Penn Central Light & Power Company of Altoona, Pa., whose entire network was put out of commission on the night of Friday, April 27, bringing a cessation of service in all the communities it serves. Through aid from the Pennsylvania Railroad and the Penn Public Service Company of Johnstown it was able to restore partial service, especially to Altoona, from 2 o'clock Saturday morning until Sunday evening, when two of the transmission lines connecting Altoona with the Williamsburg and Saxton plants were restored to service and power sufficient to carry the load was obtained. Forty-eight hours of continuous strenuous labor by a force of several hundred workers reestablished the transmission lines.

The company serves Altoona over a half dozen high-voltage lines. Two of these come from the east, two from the west and two from the south, and they are connected with four power plants. Every one of these lines went down under the weight of the snow, huge steel towers and hundreds of poles were flattened to the earth, and light and power service was cut off. There are 500 miles of transmission lines in the territory and not one was available to use.

Huntingdon, Lewistown, Mount Union and other places to the east were supplied with light and power from Warrior Ridge and Raystown. Martinsburg, Woodbury, Claysburg, Bedford and Everett were all cut off from service, but it was restored to Bedford and Everett Saturday night and to the other places not very long afterward.

The company on Saturday evening sent out a radio call requesting assistance to pull out of the wreckage and re-establish service. It brought a generous response from the Duquesne Light Company of Pittsburgh, which immediately recruited a force of 25 linemen and started them for Altoona, where they began work at 5 o'clock Sunday morning. The Pennsylvania Power & Light Company at Williamsport also picked up the message and sent five experienced men. Workman were handicapped by the deep snow, which in the mountain districts was up to their waists, but strenuous efforts overcame every obstacle, and in a very few days the discontinuance of service was an incident of the past.

A heavy wind and rain storm on May 2 damaged pole lines in central and eastern Nebraska, but prompt replacement was made possible by speedily improved weather conditions. The Nebraska Power Company had to cut out service for half of Omaha the greater part of the following day because river-carried refuse clogged the turbines. The little town of Clarks, in Merrick County, was almost wiped out by a wind of hurricane violence, and all wire companies in that neighborhood were put out of business for several days.

San Francisco Votes Bonds for Water System

Voters of San Francisco declared themselves emphatically for municipal ownership of their water system when at the primary election on May 1 they voted a bond issue of $41,000,000 for purchase of the Spring Valley Water Company's system and $24,000,000 in bonds for completion of the Hetch Hetchy water supply. Complete returns showed the following vote on the two measures: Spring Valley purchase: yes, 81,302; no, 20,852; Hetch Hetchy bonds: yes, 93,396; no, 11,497. Approval of the Spring Valley purchase has followed four unsuccessful attempts at purchase since 1910, when the proposal was first placed before the voters. The valuation of the property at $41,000,000 was set by the California Railroad Commission.

Briefer News

ACCOUNTING SECTION OF EMPIRE STATE ASSOCIATION MEETS AT BRIARCLIFF LODGE.—Seven papers on accounting subjects were scheduled for the annual meeting of the Empire State Gas and Electric Association's Accounting Section at Briarcliff Lodge, N. Y., on Thursday and Friday of this week. On Friday President H. O. Palmer of the association was to make an address and Dean Dexter S. Kimball of Cornell was to speak on "The Engineer and the Accountant."

KLAMATH LAKE PERMIT OF CALIFORNIA-OREGON POWER COMPANY OPPOSED.—A pending congressional measure which would authorize the United States government to be made a defendant in any suit started by the State of Oregon or by an irrigation district to set aside the permit of the California-Oregon Power Company to construct a dam across Klamath Lake at the Link River intake and to use the dam and impound waters for a period of 50 years will probably not be acted upon during this session of Congress, according to information obtained by State Attorney-General Van Winkle, who thinks the congested state of the congressional calendar will prevent. The state is an intervener in an action being taken by the Klamath Irrigation District to dissolve the contract and prevent the construction.

NEW RURAL SERVICE LINES IN KENTUCKY.—The Kentucky Utilities Company has announced plans for construction of a new 12-mile, 2,300-volt transmission line from Greenville to serve 40 farms in Caldwell and Crittenden Counties. A 6,600-volt line, 20 miles long, from Cumberland Gap, Ky., to Rose Hill, Va., will serve customers along the route, as well as at Ewing and Rose Hill. A new line from Paducah to West Paducah will serve 36 customers, partly rural.

NEW YORK EDISON RATE HEARINGS TO BE RESUMED.—Valuation hearings to determine whether lower rates shall be made for the New York Edison Company, which have been going on at intervals since they were instigated by Mayor Hylan nearly five years ago, are, at the company's own instance, to be continued throughout the summer, despite the city's request that they be postponed till fall. The city is preparing an inventory of property acquired by the company in 1901, maintaining that these figures will constitute the basis of its case. The company maintains that figures covering this property are already available.

RATE INVESTIGATION GETTING UNDER WAY IN ST. LOUIS.—The investigation into the rates of the Union Electric Light & Power Company in St. Louis already referred to is about to begin, and the company has filed a new schedule by which 27,303 industrial and commercial consumers will have their rates lowered to bring a total saving of $681,467. The company points out that residential rates were voluntarily reduced $600,000 in 1923, while power rates have been little reduced since 1919. However, the commissioners are also interested in lower rates for residential consumers, and it is believed that the new schedule will be a compromise between the views of the company and the commission.

THREE GUADALUPE RIVER DAMS FINISHED, SIX TO COME.—Extensions of six months from May 1 in which to carry out six projects for the construction of dams on the Guadalupe River in De Witt and Victoria Counties, Tex., have been granted the Texas Central Power Company by the State Board of Water Engineers. The Texas Central company, an Insull subsidiary, has just completed and placed in use three dams on the Guadalupe in Guadalupe County. The nine plants will comprise most of the desirable power sites on the middle Guadalupe. These are respectively 8 miles below New Braunfels, 5 miles west of Seguin and 5 miles south of Seguin.

PUTTING TAXES ON THE UTILITIES.—Light and power companies throughout Ontario County, N. Y., are in for higher taxation as the result of a resolution adopted by the Board of Supervisors at Canandaigua directing the employment of a firm of Buffalo assessment experts at a cost of $7,000 for the direct purpose of increasing tax burdens of public utility corporations. The resolution, adopted after a debate,

purports to aim to increase public utility assessments as a forerunner to reducing burdens of smaller taxpayers. The Rochester Gas & Electric Corporation, the New York Central Electric Corporation and the Empire Gas & Electric Corporation are the largest light and power companies in the county.

CINCINNATI TO EXPERIMENT WITH MUNICIPAL STREET LIGHTING.—The Cincinnati City Council has voted money from the public property fund of the city for the purpose of purchasing street-lighting equipment and standards owned by the Union Gas & Electric Company, figures compiled by Edgar Dow Gilman, public utilities director, purporting to show that this will effect a saving both for the municipality and for the property owners. At first only new installations on minor streets will be taken over, it being urged that later, upon expiration of the present lighting contract with the company, the method be extended to the limit of the city's available resources from suitable funds. Comparative estimates on the cost of lighting two actual streets are to be made.

WISCONSIN POWER & LIGHT COMPANY TO BUILD SMALL HYDRO PLANT ON ROCK RIVER AND 132-KV. TRANSMISSION LINE.—The Wisconsin Power & Light Company has announced plans for a hydro-electric plant on Rock River at Rockton, Ill., to cost $250,000. A. P. Gale, southern district manager of the utility, announced the project following negotiations by which the Rockton Electric Company, a subsidiary of the Wisconsin Power & Light, acquired the water-power property for $50,000. The present dam will be raised two feet. The new plant will supply power to Rockton and will connect with power lines which are to be built for convenience of Winnebago County rural residents. The Wisconsin Power & Light also announces that it will build a 132-kv. transmission line from the state line at Beloit to Janesville, Wis., and from Beloit to Belvidere, Ill., to connect at the latter city with a similar line running to Waukegan, Ill.

VERMONT AND NEW HAMPSHIRE COMMISSIONS STILL WAIT AGREEMENT ON CONNECTICUT RIVER JURISDICTION.—Recent hearings before the Vermont Public Service Commission on the petition of the Bellows Falls Canal Company for condemnation of farm lands near Bellows Falls, Vt., and the assessment of damages to be caused by raising the company's dam in the Connecticut River 13 ft. resulted in a further adjournment until May 22. It was brought out that the New Hampshire commission has not advised the Bellows Falls company of any decision regarding the pending petition, which asks for a modification of an order giving New Hampshire power preference over Vermont on electricity generated through raising the dam. The Vermont commission intimated that unless a modified agreement can be reached it will decide that it has no jurisdiction in the matter.

NEW UNIT AT ZILWAUKEE PLANT TO GO IN BY JUNE 1.—The new 30,000-kw. unit of the Consumers Power Company at its steam plant near Saginaw was turned over for drying-out purposes several weeks ago and will, it is expected, go on the lines by June 1. The plant has also been augmented by five stoker-fed boilers, a condenser and a new coal-handling system designed to care for an ultimate station capacity of 150,000 kw., of which 70,000 kw. is now installed.

LAMME AWARD FOR ACHIEVEMENT IN ENGINEERING.—At Ohio State University this spring a gold medal will be awarded for the first time from the Lamme foundation, of which the late Benjamin G. Lamme, long the chief engineer of the Westinghouse Electric & Manufacturing Company, an alumnus

of the class of 1888, was the donor. The medal, which contains $100 worth of gold, is to be awarded every five years to a graduate in any branch of engineering at Ohio State. Together with a bas-relief of Mr. Lamme, with the dates of his birth and death, 1864 and 1924, it bears a quotation for which he became noted: "The engineer views hopefully the hitherto unattainable."

THREATENED BREAK IN A SOUTH CAROLINA DAM AVERTED.—Engineers succeeded by hard work in averting a threatened break in a waterworks dam 31 miles north of Greenville, S. C., which caused thousands of residents in the South Saluda River Valley to flee from their homes at the end of last week. The threatened structure is described as an earth dam 700 ft. long, 783 ft. thick at the base, tapering to 30 ft. at the top, and 140 ft. high, holding five billion gallons of water. For a time there was thought to be danger to other dams lower down the stream, should the Greenville dam break, and it is reported that the floodgates of a power dam at Piedmont were opened as a precautionary measure. A hundred miles southeast of the threatened dam the great hydro-electric project of the Lexington Water Power Company is under construction, with the fall of 1931 set for its completion. President W. S. Barstow of the General Gas & Electric Corporation, which is behind the Saluda Dam project, scouted the idea of danger to it from future floods or breaks, pointing out that the reservoir to be built and known as Lake Murray will be 33 miles long with an average width of 3½ miles and a maximum width of 14 miles.

PORTLAND, ORE., ASKS RATE VALUATIONS OF ITS ELECTRIC SERVICE COMPANIES.—Rate valuations of the Portland Electric Power Company and the Northwestern Electric Company, the two Portland (Ore.) utilities which recently failed to obtain the approval of the city voters to merge their holdings, are asked by Portland authorities in a request to the Public Service Commission. According to Commissioner H. H. Corey, any reduction of rates of at least one of the utilities under consideration will not be confined to that city, nor, he states, will it be possible under the law to confine the investigation to Portland alone. To establish lower rates in the metropolis, he says, it will be necessary for the commission also to require that the Portland Electric Power Company equalize its tariff in respect to service rendered as far as 51 miles south to the city of Salem. The recent action of the commission upon its own motion will have precedence in the matter of the valuation probe of the two Portland utilities, but the commission has signified its willingness to co-operate with the municipal authorities.

SEATTLE BILL FOR MUNICIPAL ACQUISITION OF PUGET SOUND POWER & LIGHT PLANTS KILLED.—Opposed solidly by the majority group in the City Council, Councilman W. T. Campbell's bill designed to pave the way for acquisition by the city through condemnation proceedings of important properties of the Puget Sound Power & Light Company was killed at a recent Council session. The bill authorized a preliminary survey and appraisal of the company's Seattle distribution system and its Snoqualmie Falls and White River power plants and carried an appropriation of $25,000 to defray the cost of the appraisal. As originally drawn, the Mount Baker power plant was included in the property to be appraised, but the sponsors of the ordinance finally omitted it from the list. Those members of the council who supported the measure declared it necessary on the ground that sooner or later either the company or the city is bound to have a monopoly.

PLANS ENLARGEMENT OF NIOBRARA RIVER PLANT UNDER INCREASED HEAD.—The Northern Nebraska Power Company, which operates a hydro-electric plant on the Niobrara River, near Spencer, announces that it will construct a million-and-a-half-dollar plant at a point 10 miles south and 6 miles east of Spencer, which will increase its annual production from 15,000,000 kw.-hr. to 75,000,000 kw.-hr. The company, through E. A. Forbes, president, has contracted to sell the entire output to the Interstate Power Company, which

operates in Nebraska, Minnesota, Iowa and South Dakota, covering a 300-mile-square territory. Mr. Forbes says that peculiar riverbed construction of the Niobrara makes possible the development at the point chosen of the largest hydro-electric plant in the state and the production of electrical energy at a cost below that of any steam plant in the state. The present plant has a 15-ft. drop. The new one will have a 50-ft. drop, thereby adding grreatly to the production possibilities of the site.

BEAUHARNOIS PROJECT OFFICIALLY AUTHORIZED.—In so far as the Province of Quebec is concerned, the Beauharnois project (ELECTRICAL WORLD, March 10, page 523) was officially authorized on April 28 by the signing of an order in Council granting the Beauharnois Light, Heat & Power Company the right to divert 40,000 cu.ft. of water per second between Lake St. Francis and Lake St. Louis on the St. Lawrence for the development of hydro-electric power, most of which will be absorbed by large industrial concerns in the immediate vicinity of Montreal. In addition to paying a yearly rental of $20,000 in advance for the first five years and $50,000 per year for the remaining period, the company has agreed to develop 100,000 hp. during the first five years, 200,000 hp. after the sixth, 300,000 hp. after the seventh and 500,000 hp. at the end of ten years. An announcement that the company would apply to the International Joint Waterways Commission for approval of its plans has called forth criticism in the Canadian Senate, on the ground that such sanction would encroach on provincial rights and that the question of jurisdiction should be settled by negotiation between Canada and the United States.

Coming Meetings

[A complete directory of electrical associations, with their secretaries, is published in the first issue of every volume. For latest list see ELECTRICAL WORLD for Jan. 7, page 80.]

Arkansas Utilities Association—Arlington Hotel, Hot Springs National Park, May 14-16. R. I. Brown, Arkansas Power & Light Co., Little Rock.

American Society of Mechanical Engineers—Pittsburgh, May 14-17. Calvin W. Rice, 29 West 39th St., New York.

Indiana Electric Light Association (jointly with Indiana Public Utilities Association) — Columbia Club, Indianapolis, May 22-24. William Stokes, 1548 Consolidated Bldg., Indianapolis.

National Electric Light Association—Atlantic City, June 4-8. P. S. Clapp, 420 Lexington Ave., New York.

American Association of Engineers—Hotel Hussman, El Paso, Tex., June 4-6. M. E. McIver, 63 E. Adams St., Chicago.

Electrical Supply Jobbers' Association—The Homestead, Hot Springs, Va., June 5-8. E. Donald Tolles, 165 Broadway, New York.

National Electrical Manufacturers' Association—The Homestead, Hot Springs, Va., June 11-15. S. N. Clarkson, 420 Lexington Ave., New York.

Pacific Coast Division, N.E.L.A. — Hotel Huntington, Pasadena, Cal., June 12-15. S. H. Taylor, 447 Sutter St., San Francisco.

Georgia Electrical Association—Savannah, June 14 and 15. J. J. McDonough, Georgia Power Co., Dublin, Ga.

Northwest Division, N.E.L.A.—Portland, Ore., June 19-22. B. Snow, 1208 Spalding Bldg., Portland, Ore.

Canadian Electrical Association—SS. "Richelieu" from Montreal to Saguenay and return, June 20-23. H. M. Lyster, 712 Power Bldg., Montreal.

American Institute of Electrical Engineers—Cosmopolitan Hotel, Denver, June 25-29. F. L. Hutchinson, 33 West 39th St., New York.

Association of Iron and Steel Electrical Engineers—Hotel Stevens, Chicago, June 25-28. J. F. Kelly, Empire Bldg., Pittsburgh.

American Society for Testing Materials — Chalfonte-Haddon Hall, Atlantic City, N. J., June 25-29. C. L. Warwick, 1315 Spruce Street, Philadelphia.

East Central Division, N.E.L.A.—Cedar Point, Ohio, July 10-13. D. L. Gaskill, Greenville, Ohio.

Recent Court Decisions

COMPANY RESPONSIBILITY FOR MISHAPS ALLEGED TO BE ATTENDANT ON RIGHT-OF-WAY CONSTRUCTION.—The Court of Civil Appeals of Texas has sustained a jury finding of company responsibility in Kleinstein vs. West Texas Utilities Company. This was a damage suit brought by a land owner against the owner of a transmission line built over his land. Alleged losses incurred included the escape of cattle through a gap in the owner's fence said to have been made by the company. This claim was properly submitted to the jury, the court held, as was the damage sustained by the alleged cutting of the right-of-way to an excessive width. (3 S. W. [2d] 882.)*

LACK OF LEGAL EVIDENCE OF OWNERSHIP OF POLE ABSOLVES COMPANY WHOSE STENCIL IT BORE FROM LIABILITY FOR ACCIDENT.—A pole alleged to belong to the Lowell Electric Light Corporation fell when a lineman employed by the city climbed it to repair wires belonging to the city, and he was injured, a damage suit (Lynch vs. Lowell Electric Light Corporation) resulting. The Supreme Judicial Court of Massachusetts has reversed a verdict for the plaintiff on the ground that since no permit for the erection of this pole, which had stood for twenty years, could be found in the city's records ownership was not proved, the existence of the pole was a nuisance and the city in attaching its own wires to it was a trespasser or at most a licensee to whom the company owed no duty. "Although the pole in question bore a number and a metal strip with the letters L.E.L. stenciled thereon, there is no claim that there were wires of the defendant on or attached to the pole at the time of the accident," the court said. "On the uncontradicted evidence that the defendant after the accident removed the fallen pole, cut off a section and destroyed the remainder of it, with other circumstantial evidence, the jury would have been warranted in finding that that pole was then owned by the defendant." (160 N. E. 413.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Commission Rulings

"GOING-CONCERN" VALUE NOT TO BE ESTIMATED ON PERCENTAGE BASIS.—In adjusting a complaint made by the city of Erie against the Mutual Telephone Company the Pennsylvania Public Service Commission found fault with the method of estimating "going-concern" value by percentages followed by both contestants, saying: "The commission will not accept such a method as the proper procedure for arriving at this value. The going-concern value of any public utility, when such value exists, must be determined from the circumstances of the particular case." The commission cut down the company's figure—$407,061—and the city's figure—$340,000—to $300,000, basing its own figure on a consideration of the character of the plant and a study of its operations, together with the advantages to the public derived from a recent consolidation.

THE ARGUMENT AGAINST "GOING-CONCERN" VALUE AS A FACTOR IN RATE BASE.—In determining rates for an Indiana telephone company recently the Indiana Public Service Commission made a radical departure from usual methods by giving no consideration at all to "going-concern" value. "Going value and overhead costs have been the bone of contention in practically every big rate case that ever has come before this body during my years of service," Commissioner John W. McCardle, who wrote the order, declared. "Its elimination in this case marks a step forward in relieving the patron of an added burden and in reducing the actual costs incurred during rate proceedings. The patrons of a utility will be very slow to agree that any amount of going value should be added to capital account and a rate of return received on it; in fact, with the safeguards surrounding and protecting a utility from competition which are provided by the Indiana utility law, it is doubtful if going value ever should be added, for the reason that the law grants a monopoly, the consumers pay the cost of building up the business and an adequate return on the investment always is guaranteed the investor from the beginning. No two engineers agree as to what constitutes going value. Some say good will, some an opportunity to do business; some maintain that no expense is incurred to get new business after the business once is established." Continuing, the order says: "It is refreshing to note that the petitioner has not offered in evidence any appraisal of its property on the theory that its present fair value based on what it would cost to reproduce the property new is greatly in excess of what it really cost, as is usually done, but is content to rely on the book cost of the property as being a fair rate base in this case. This gives the commission an opportunity to allow a return upon the petitioner's investment, which is quite rare in present-day rate making. We wish to commend the attitude of the petitioner in this respect and to remark in passing that if more of the utilities would assume this attitude, a long step would be taken to promote harmony and a better public relationship between the patrons and the utility and reduce the rate-making process to a fairer and easier task." An increase designed to insure 7 per cent on the investment was granted by the commission.

News About Men of the Industry

D. N. Lewis Assumes New Duties in Chicago

Dwight N. Lewis, formerly commerce counsel of the Iowa Railroad Commission, is now vice-president of the United Public Service Company with offices in Chicago. Though a lawyer by profession, Mr. Lewis has long been prominently identified with the public utility industry. Mr. Lewis is a native of Iowa and a graduate of the Drake University Law School at Des Moines. For approximately 30 years he has been connected with the Iowa commission, at first being the whole office force, in charge of accounting, secretarial work,

D. N. Lewis

rate work and reporting. Gradually he advanced to be secretary and later counsel, which position he held for six years. Finally he became a member of the commission, and in 1927, after serving several terms, he was named commerce counsel. It was from this office that Mr. Lewis resigned to remove to Chicago. He has always devoted considerable time to the affairs of the National Association of Railroad and Utilities Commissioners and his successful committee work in that association culminated in his election to the presidency in 1922.

DR. FELIX DEUTSCH, head of the Allgemeine Elektrizitäts-Gesellschaft, has just celebrated his 70th birthday. Dr. Deutsch paid his first visit to America last fall.

L. L. BAILEY, commercial manager of the Keystone division of the West Penn Power Company with headquarters at Ridgway, has been promoted to the position of assistant to W. S. Finlay, Jr., president of the West Penn Electric Company, the parent company of the West Penn Power Company. He will make his headquarters in Pittsburgh. For the past 4½ years Mr. Bailey has been commercial manager of the Keystone division. He joined the company in August, 1923, as power engineer and on Jan. 1, 1924, was appointed to the position of commercial manager of the Keystone Power Corporation. On July 1, 1927, when the Keystone Power Corporation was merged with the West Penn Power Company, he assumed the duties he is now relinquishing.

N. G. HARVEY, who recently resigned as president of the Illinois Electrical Supply Company and of the Electric Association of Chicago, was the guest of honor at a farewell luncheon given at the Union League Club, Chicago, April 30. The occasion marked the withdrawal of Mr. Harvey from the business life of Chicago to reside permanently in California. W. W. Low, president of the Electric Appliance Company, was the toastmaster. Twenty-three men attended, all of whom have been active in local electrical circles.

M. L. HIBBARD, formerly chief operating engineer of the Northern States Power Company, who joined the Electric Bond & Share Company, New York, early this year, as announced in the Jan. 21 issue of the ELECTRICAL WORLD, has been assigned to the Idaho Power Company, Boise, in the capacity of assistant general manager.

C. P. POTTER, engineer in charge of large motor and transformer divisions of the Wagner Electric Corporation, St. Louis, Mo., has been elected chairman of the St. Louis Section of the American Institute of Electrical Engineers. Ever since he joined the Institute at the time he graduated from the University of Illinois, in June, 1909, he has been serving on various committees, and last year served as vice-chairman of the St. Louis Section.

J. E. ALDRED of Aldred & Company, investment bankers of New York and chairman of the board of directors of the Consolidated Gas, Electric Light & Power Company of Baltimore, returned April 30 aboard the *Leviathan* from an inspection trip of the hydro-electric properties in France and in Italy in which the International Power Securities Corporation has invested. Mr. Aldred is president of the International.

M. F. SIMMONS has been appointed assistant to the vice-president in charge of General Electric manufacturing, according to an announcement made by C. C. Chesney, vice-president of that company. Mr. Simmons, who has been general supervisor of production, will continue in that capacity and will take over such other duties as may be assigned from time to time. He entered the service of the General Electric Company 25 years ago. For fifteen years he was in charge of the cost department at the Schenectady plant, and in 1921 was made assistant to the manager. Three years ago he was appointed general supervisor of production on the staff of the vice-president in charge of manufacturing.

F. S. Dewey General Sales Manager in Cincinnati

Fred S. Dewey, vice-president in charge of lighting and power sales of the Kansas City Power & Light Company, has severed his connection with that utility to become general sales manager of the Union Gas & Electric Company, Cincinnati. Mr. Dewey has been identified with the Kansas City utility since 1918, when he became assistant general manager, and a few years ago, when the company was reorganized, he became a vice-president in charge of power and lighting sales. A native of Murray, Iowa, Mr. Dewey entered the

F. S. Dewey

public utility field immediately following graduation from the Iowa State College. His early experience was in the operation of the steam and gas plants of the Tri-City Electric Company, but he soon transferred his interests to the selling branch of the industry as power salesman.

In 1915 he removed to Muscatine, Iowa, to affiliate himself with the local railway company and two years later he was appointed general manager of the Muscatine Light Company, the position he held until he became assistant general manager of the Kansas City property. Mr. Dewey has been active in the American Institute of Electrical Engineers, the Missouri Association of Public Utilities, the Kansas City Electric Club, the American Society of Mechanical Engineers, the Middle West Division of the National Electric Light Association and other societies.

SAMUEL INSULL, president of the Commonwealth Edison Company, Chicago, arrived in New York May 8 aboard the White Star liner *Majestic* after a short trip abroad.

HERBERT A. WAGNER, president of the Consolidated Gas, Electric Light & Power Company of Baltimore, who recently was elected a director of the Baltimore Association of Commerce, has also been elected a vice-president.

Wentling Directs Research for Cedar Association

John P. Wentling has been appointed director of the research division of the Western Red Cedar Association with headquarters at Minneapolis. Mr. Wentling, who has held a chair in the division of forestry, University of Minnesota, is recognized as one of the foremost authorities on wood technology. He received his professional training in

J. P. Wentling

forestry at Yale University, which was supplemented by practical experience obtained during a four-year connection with the United States Forest Service. After spending two years as instructor in wood technology at the Pennsylvania State Forest School, in 1908 he joined the teaching staff of the University of Minnesota in the division of forestry. During his affiliation with that institution he has organized and developed courses in wood technology and forest products as a major field of study in the division of forestry.

In addition to his academic work, Mr. Wentling has frequently been called upon as consultant by outside interests. He is well known among the industries producing forest products, having addressed many state and national lumber organizations as well as various engineering societies.

A. WAINRIGHT, formerly operating vice-president of the Inland Power & Light Corporation, has resigned to affiliate himself with A. E. Fitkin, formerly owner of the Inland properties and now active in utility affairs in Los Angeles.

A. D. BABSON, assistant manager of the central-station department of the New York district of the General Electric Company, retired May 1 after 37 years of active work with the General Electric Company and its predecessor, the Edison General Electric Company. He entered the employ of the Edison General Electric Company in New York as an estimator and after the consolidation of that company with the Thomson-Houston Company he became engineer of the Washington office. He subsequently was identified with the Baltimore office, the New England district and for a while he was assistant to the late Gen. Eugene Griffin, vice-president of the company. In 1903 he was appointed manager of the supply department of the New York district, which position he held until a few years ago, when he became assistant manager of the central-station department, the supply department having been divided into other company departments.

GEORGE W. MASON has been elected president of Copeland Products, Inc., manufacturer of electric refrigeration machines, Detroit, succeeding William Robert Wilson, who becomes chairman of the board. Mr. Mason became vice-president and general manager of Copeland Products, Inc., in March, 1926. He had previously established a reputation in production circles as works manager for the Chrysler Motor Corporation.

T. G. Nee Becomes President of Acme Wire

Thomas G. Nee of New York has been elected president of the Acme Wire Company, New Haven, Conn., to succeed Victor M. Tyler, who retired. Mr. Nee is a graduate engineer of the University of Wisconsin. From 1905 to 1917 he was connected with the Mexican Telephone & Telegraph Company as vice-president and chief engineer in charge of all the company's operations in Mexico. Subsequently he spent ten years with the Allied Machinery Company of New York, which was owned by the American International Corporation of that city, as president of its most important subsidiary, the Horne Company, Limited, in Japan. He made a notable success of this undertaking, particularly during the trying years following the war.

Mr. Nee has had a broad business training in lines that make him thoroughly familiar with the products of the Acme Wire Company. His long connection with the telephone and telegraph industry familiarized him with coils, wire of all kinds, condensers and other electrical wire products. Mr. Nee was also elected a member of the board

T. G. Nee

of directors of the Acme Wire Company to succeed James T. Moran, resigned. JAMES W. HOOK, president of the Geometric Tool Company, New Haven, was elected chairman of the executive committee of the Acme Wire Company and WILLIAM G. REDFIELD, president of the New Haven Bank, was elected a member of the board of directors of the Acme organization to succeed James E. Wheeler, who has resigned.

Obituary

GEORGE OFFOR, pioneer in the electrical industry in England, died recently at his home in Sydenham, London. Mr. Offor had celebrated his 101st birthday just a few days prior to his death.

PAUL T. BRADY, special representative in New York of the Westinghouse Electric & Manufacturing Company, with which he had been associated for 34 years, died suddenly May 3 at the home of his son in Portland, Ore. A graduate of Phillips Exeter Academy, Mr. Brady had been affiliated with various branches of the electrical industry since 1881. During his connection with the American Telephone & Telegraph Company he helped to extend the telephone system through the southeastern portion of New York State, and after joining the Thomson-Houston organization in 1890 he became its manager for the State of New York and the Middle West. In 1894 he was appointed New York State manager for the Westinghouse company with headquarters at Syracuse, but in 1907 he removed to New York as special representative. Among the public utilities which he helped to develop are the Rochester Gas & Electric Company, Niagara, Lockport & Ontario Power Company, Central Georgia Power Company, Virginia Power Company and the Southeastern Power & Light Company. In commenting on Mr. Brady's death, E. M. Herr, president of the Westinghouse company, said: "Mr. Brady was one of the pioneers of the electric light and power industry. Combining technical electrical knowledge with financial ability, he has left behind his as a monument more than a score of successful electrical systems." Mr. Brady was 71 years of age.

HUGH K. PRICHITT, head of Prichitt & Company, investment bankers of New York, and a member of the board of directors of the Dubilier Condenser & Radio Corporation, died April 27 at his home in New York after a week's illness. At the time of his death Mr. Prichitt was an officer and director in several industrial enterprises.

Financial and Statistical News

Markets Exceedingly Active Preferred Stocks Firm

WITH further merger rumors and exceedingly heavy buying, the utilities securities markets have had one of the busiest weeks this year so far. Prices of several power and light common stocks have shown gains for the week of anywhere from five to twenty points. Among the most active issues were Columbia Gas & Electric, which advanced twelve points, and American Gas & Electric, which gained seventeen points and touched a new high of 167. Middle West Utilities took a further jump of seventeen points to a new high of 169, and Public Service of New Jersey continued its upward movement with a gain of about ten points to a high of 66⅜. Smaller gains are recorded in the case of several other issues, such as Commonwealth Edison, Edison of Boston, Philadelphia Electric, Southern California Edison, Electric Investors, etc.

Preferred stocks of the power and light companies continue to show strength, regardless of higher money rates, and prices are well maintained in the bond market with a marginal upward tendency, especially in the case of the higher grade issues.

April Financing Reaches Total of $279,535,000

REACHING a total of $279,535,000, power and light company financing for April was more than double that for April of last year and accounted for almost one-half of the total volume of financing this year to date. This brings the total for the first four months up to $609,941,852, against an aggregate of $612,390,500 for the corresponding period of 1927. In other words, the volume of financing so far this year is keeping pace with the unprecedented record made last year.

Although it is impossible as yet to state accurately what proportion of the above financing constituted refunding operations, it may be assumed that at least $200,000,000 was for this purpose. Some of the largest issues of the month were almost entirely for refinancing, and the gain in interest charges exceeded 2 per cent in some instances.

A comparison of the totals by months this year and last follow:

	1928	1927
January	$98,850,000	$223,859,000
February	103,255,500	166,000,000
March	128,301,352	96,775,000
April	279,535,000	125,756,500
	$609,941,852	$612,390,500

Allis-Chalmers Billings Up 6.4 per Cent

Billings for the first quarter of 1928 of the Allis-Chalmers Manufacturing Company show an increase of 6.4 per cent over the corresponding quarter of 1927. Earnings on a comparable basis also reflect an increase inasmuch as there was no fixed charge for debenture interest in the early months of 1927. Entire earnings were available for both preferred and common dividends. In the first quarter of 1928, the preferred stock having all been retired in July, 1927, earnings equivalent to $2.60 per share accrue wholly to common stock holders.

Bookings for the first quarter of 1928 were $8,370,537, against $7,833,622 for the first quarter of 1927. Unfilled orders as of March 31 were $9,973,862.

Security Issues of Electric Service Companies in April

Name of Company	Amount of Issue (Par Value)	Period Years	Class	Purpose	Interest Rate	Price	Per Cent Yield
American Gas & Electric Co	$50,000,000	100	Gold debentures	To redeem bonds	5	101	4.95
New England Power Association	25,000,000	20	Gold debentures	To retire short-term bank loans and for the payment of other indebtedness	5	100	5.00
Gulf Power Co	2,500,000	40	First and refunding mortgage gold bonds	Pay off notes	5	99	5.06
Central States Edison Co	1,350,000	15	First lien gold bonds, series A	To retire existing funded debt, to defray cost of acquiring additional properties and for other corporate purposes	5½	97½	5.75
	675,000	3	Convertible gold notes		5½	98½	6.05
North Continent Utilities Corp	1,250,000	..	Cumulative preferred stock	Extensions and betterments or for other corporate purposes	7	100	7.00
Minnesota Power & Light Co	14,000,000	50	First and refunding mortgage gold bonds	To retire bonds	4½	97½	4.64
American Electric Power Corp	3,272,500	..	Preferred stock	To retire debentures	6	93¾	6.40
New England Public Service Co	4,387,500	..	Preferred stock	To refund short-term loans and for other corporate purposes	6	97½	6.15
Iowa Public Service Co	500,000	..	Cumulative first preferred stock	To reimburse for extensions and betterments and for the acquisition of properties	6	100	6.00
Cincinnati Gas & Electric Co	35,000,000	40	First mortgage gold bonds, series A	Incident to consolidation	4	92½	4.40
Queens Borough Gas & Electric Co	4,000,000	30	Refunding mortgage gold bonds	To reimburse for retirement of bonds and for additions and extensions	4½	100	4.50
Super-Power Co. of Illinois	10,000,000	40	First mortgage gold bonds	To defray cost of additions and extensions	4½	98½	4.58
Central States Electric Corp	10,000,000	..	Cumulative preferred stock	To acquire additional investments, to liquidate current indebtedness and for other corporate purposes	6	101	5.94
Associated Gas & Electric Co	63,000,000*	20	Convertible gold debentures	To retire debentures outstanding and securities of subsidiaries, for the acquisiting of property and for other corporate purposes	4½	97	4.73
Cities Service Co	50,000,000	30	Gold debentures	To retire funded debt and for the retirement or acquisition of funded debt or preferred stocks of subsidiaries	5	98	5.13
Railway & Light Securities Co	3,000,000	25	Collateral trust gold bonds	To retire securities and for the purchase of additional securities	4½	94½	4.90
Iowa Power & light Co	1,000,000	..	Cumulative preferred stock	To reimburse for additions and extensions, for acquisition of properties and of securities	6	100	6.00
Kentucky Power & Light Co	600,000	2	Gold notes	To discharge obligations incurred in connection with acquisition of new properties	5½	99½	5.75
Total	$279,535,000 (par value)			Rights	$4,807,656		
Total amount actually realized	273,518,225			Total financing for April	$278,325,881		

*Offered to stockholders at 97.

American & Foreign Power Acquires Mexican Properties

A plan has been consummated whereby the American & Foreign Power Company, Inc., will acquire the collateral gold bonds, preferred stock and common stock of the Mexican Utilities Company by giving its 6 per cent preferred stock in exchange for the other company's securities on the following basis:

For each $100 principal amount of the collateral gold bonds of the Mexican Utilities Company, nine-tenths of a share of the $6 preferred stock of the American & Foreign Power Company, Inc., with a cash adjustment of accrued interest.

For each share of the preferred stock of the Mexican Utilities Company, 75-100ths of a share of the $6 preferred stock of the American & Foreign Power Company, Inc., with a cash adjustment of accrued dividends.

For each share of the common stock of the Mexican Utilities Co., 35-100ths of a share of the $6 preferred stock of the American & Foreign Power Company, Inc.

The privilege of exchange is extended to all holders of collateral gold bonds, preferred stock and common stock now outstanding of the Mexican Utilities Company who shall avail themselves thereof by depositing their holdings on or before June 1, 1928, or on or before any extended date. The American Exchange Irving Trust Company, 60 Broadway, New York, is depositary under the plan.

The Mexican Utilities Company is a holding company organized three years ago in Maine.

General Gas & Electric System Net Income Up 8 per Cent

By a reduction of about 4 per cent in operating expenses, taxes and maintenance the officers of the General Gas & Electric group succeeded in showing an 8 per cent growth in net revenue, although gross revenue increased less than 2 per cent during 1927. Details of financial operations covering its large-scale hydro-electric development near Columbia, S. C., will be given in a later issue.

INTERNATIONAL POWER STOCK. — Shareholders of the International Power Securities Corporation at their recent annual meeting approved an increase in authorized common stock from 350,000 to 1,000,000 no-par shares.

New Capital Issues

During the week ended May 10 the Southern Cities Utilities Company made an offering of 30-year 5 per cent first lien and collateral trust gold bonds, series A, to the amount of $10,500,000, the price being 94 and accrued interest, to yield 5.40 per cent.

The Rumford Falls Power Company (Maine) issued general mortgage 4½ per cent gold bonds to the amount of $2,000,000 at 98½ and accrued interest, to yield over 4.60 per cent. These bonds mature May 1, 1948.

The American Power & Light Company issued 200,000 shares of $5 preferred stock, series A, stamped certificates at $95 a share plus an amount equal to accrued dividends at the rate of $5 per share per annum from April 1, 1928, to yield 5.25 per cent.

With the purpose of retiring 7 per cent prior preference stock the Puget Sound Power & Light Company issued 110,000 shares of $5 dividend prior preference stock at 96 and accrued dividend, to yield 5.20 per cent.

One foreign offering was made—a three-and-a-half-million-dollar issue of

Stock Quotations of Electric Light and Power and Manufacturing Companies

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies	Bid Price Tuesday May 8	Low 1928	High 1928
ABITIBI PWR. & PAPER, com., new — no par	81	72	85
Ala. Pwr., $7 cum. pf.—no par	*k*114½	114½	115½
Allis Chalmers Mfg.,6% com.,ex.div.	129½	115½	129½
Aluminum Co. of Amer., com.	166	120	166
Aluminum Co. of Amer., 6% pf.	109½	105½	109½
Amer. & Foreign Pwr., 7% pf.—no par	109½	105½	109½
Amer. & Foreign Pwr., com.—no par	37½	22½	38½
Amer. Bosch Magneto, com.—no par	34½	15½	34½
Amer. Brown Boveri Elec.†	18½	10½	18½
Amer. Brown Boveri Elec., pf. $7	63	40½	65
Amer. Gas & Elec., 6% pf.—no par.	110	106½	111
Amer. Gas & Elec., com. †—no par.	166½	117½	167
Amer. Lt. & Trac., 6% pf.	115	116	120
Amer. Lt. & Trac., new com.	219½	170	220
Amer. Pwr. & Lt., 6% pf.	107½	104	109½
Amer. Pwr. & Lt., com. †—no par	88½	62½	89½
Amer. Pub. Serv., 7% pf.	*a*101	97½	101
Amer. Pub. Serv., com. †	*k* 70	70	75
Amer. Pub. Utilities, 7% pfc. pf.	*a* 96½	87½	97
Amer. Pub. Utilities, 7% pr. pf.	*a*102½	95½	102½
Amer. Pub. Utilities, com.	*k* 60	60	65
Amer. States Sec., A.	*a* 12½	4	13
Amer. States Sec., B.	*a* 16½	4½	16½
Amer. Superpwr., 6% 1st pf.	*l*104½	....	....
Amer.Super pwr., Class A†—no par	43½	36½	56
Amer.Super pwr., Class B†—no par	48½	37	56½
Amer. Wtr. Wks. & Elec., 6% pf.	*k*104½	101½	106
Amer. W.W. & E., com. new—no par ex.div.	68	52½	70½
Anaconda Copper cap. $3	72	53½	72½
Appalachian Electric Pwr., 7% pf.	109	108½	110
Arkansas Pwr., & Lt. 7% pf.	107½	107½	111
Assoc. Gas & Elec., $3.50—50	54½	....	....
Assoc. Gas & Elec., pf.—$6—no par.	95	96	98½
Assoc. G. & E., Class A, 10—no par.	50½	47	51½
BABCOCK & WILCOX, 7% com.	122	117½	124½
Binghamton L., H. & P., $6 pf.	108	102	109½
Birmingham Elec., pf.—$6—no par.	107	104	107
Blackstone Valley G. & E., 6% pf.	*k*106	106	112
Blackstone Valley Gas & Elec., 10% com.—50	*k*165	135	170
Blaw-Knox, com.†	*d*101	91	105
Brazilian Trac., Lt. & Pwr., $7 com.	*m*246	....	....
Brazilian Trac., Lt. & Pwr.,com.,new	*f* 63	....	....
Broad River Pwr., 7% pf.	105	105	108½
Brooklyn Edison, 8% com	263½	206½	268½
Buffalo, Niagara & East. Pwr., $1.60 pf.—25	*l* 26½	....	....
Buffalo, Niagara & East. Pwr. com. $1.20—no par	*l* 41	....	....
CALIFORNIA ELEC. GENERATING, 6% pf.	99	98	101
California Ry. & Pwr., 7% pf.	135	....	....
Carolina Pwr. & Lt., pf.—$7—no par	*l*108	109	110½
Central & S. W. Util., $7 pf.—no par	*a*104	99½	105½
Central & S. W. Util., pr. ln. $7 pf.—no par	*a*110½	103½	110
Central Ark. Ry. & Lt., 7% pf.	106	105	107½
Central Ill. Pub. Serv., $6 pf.	*a* 99½	97½	100½
Central Ind. Pwr., 7% pf.	*a*100½	95	100½
Central Maine Power, 6% pf.	98	96	98½
Central Maine Power, 7%	110	109	112
Central Pwr. & Lt., 7% pf.	109½	104½	110
Central States Elec., 7% pf.	117½	104½	119½
Cincinnati Gas & Elec., 5% com.	*g*100½	....	....
Cities Service, $6 pf.—no par	*l* 103½	94½	103½
Cities Service, pf. B—no par	*l* 9½	8½	9½
Cities Service, pf. BB—no par.	*l* 97	88½	97
Cities Service, com.—20	*l* 66½	54	67½
Cities Service, Bks. Shrs.—10	*l* 32½	26½	33½
Cities Service Pwr. & Lt., 7% pf.	*k*108	106	109½
Cities Service Pwr. & Lt., 6% pf.	102	95½	102
Cleveland Elec. Illg., 6% pf.	113	113	115½
Cleveland Elec. Illg., 10% com.	415	350	425
Columbia Gas & Elec., 6% pf.	109	107½	110½
Columbia G. & E. com. $5—no par	117½	89½	117½
Columbus Elec. & Pwr., $2 com.—no par.	79½	54	79½
Columbus Elec. & Pwr. 7%	113	....	....
Columbus Ry., Pwr. & Lt., 7%	109½	....	....
Columbus Ry., Pwr. & Lt., 7% pf. B	*l* 9½	....	....
Columbus Ry., P.& L t. com. no par	120	120	125
Commonwealth Edison, 8% com.	*a*189	165	189
Commonwealth Pwr., 6% pf.	103½	102½	104½
Commonw'th Pwr., $2, com.—no par	87½	62½	87½
Conn. Lt. & Pwr., 8% pf.	121	120	123
Conn. Lt. & Pwr., 7% pf.	117	118	121
Cons. Gas of N. Y., pf.	104	101½	105
Cons. Gas of N. Y., com. $5—no par. ex.div.	168½	119½	170½
Cons. Gas, Elec. Lt. & Pwr. of Balti., 6% pf.	*e*111½	110	113
Cons. Gas, Elec. Lt. & Pwr. of Balti., 5% pf.	*e*105	100½	105½
Cons. Gas, Elec. Lt. & Pwr. of Balti., com. $3.00—no par.	*e* 89½	67½	93
Consolidated Pwr. & Lt., 7% pf.	105	....	....
Consumers Pwr., 6% pf.	104½	106	107
Consumers Pwr., 6.6% pf.	105	106	107
Continental Gas & Elec., 7% pr. pf.	108½	106½	108½
Conti. G. & E. com. $4.40—no par.	*k*230	240	265
Crocker Wheeler, com.†	44	....	....
Crocker Wheeler, 7% pf.	93	....	....
DALLAS PWR. & LT., 7% pf.	110	110	111½
Dayton Pwr. & Lt., 6% pf.	109	108½	110½
Derby Gas & Elec., 7% pf.	102	96	100½
Detroit Edison, 8% com.	191	166½	194½
Dubilier Condenser, com.—no par.	4½	2½	5½
Duke Pwr., cap	*k*138	130	145
Duquesne Lt., 5% pf.	105½	104½	105½
EASTERN NEW YORK UTIL., $7 pf.	*k*110½	111	112½
Eastern States Pwr. B	24½	11½	25½
Eastern States Pwr., pf.	*k* 99½	98	100½
East. Tex. Elec., 7% pf.	108	106	109
Edison Elec. of Boston, $12 com.	*d*281½	252	284½
El Paso Elec. 7% pf.	113	110	112½
Elec. Bond & Share, 6% pf.	*l*110½	108½	111½
Elec. Bd. & Sh. Sec., com. $1—no par ex. rights	*l*119½	76	127½
Electric Household Util.†	*a* 24½	13½	25
Elec. Investors, 6% pf.—no par.	103½	101	104½
Elec. Investors, com.†—no par.	69	40½	69
Elec. Pwr. & Lt., ctfs. pf.	110	106½	110½
Elec. Pwr. & Lt., ctfs., 40% pd.	*m*127	120½	129½
Elec. Pwr. & Lt., ctfs., com.—no par	44½	28½	44½
Elec. Ry. Securities, com.—no par.	6½	....	....
Elec. St. Battery com. $5.25—no par	81½	69	83½
Elmira Wtr., Lt. & R.R., 7% pf.	105	104	107
Empire Pwr., pfc.†	37½	27½	37½
Engr. Pub. Serv. $7, pf.—no par	110½	107	110½
Engr. Pub. Serv., com.—no par.	45½	33	46½
Eureka Vacuum Cleaner, com. $4—no par.	75½	69	79
FAIRBANKS MORSE, 7% pf.	111½	104	111½
F.-M., com.—$3—no par	48	32½	54
Federal Lt. & Trac.,com $1.40	55½	42	56½
Federal Lt. & Trac., $6 pf.—no par.	107½	98	109
Florida Pwr. & Lt., 7% pf.	*k*108	105	108
Ft. Worth Pwr. & Lt., 7% pf.	*l*114½	113	114½
GALVESTON-HOUSTON ELEC. 6% pf.	82	75	85
Galveston-Houston Elec., com.	36	31	34
General Cable, Cl.A	75	56	84½
Gen. Elec. $3 com.—no par.	174	124	174½
Gen. Elec., special—6%	11½	11½	11½
Gen. Gas & Elec. (Del.) com A $1.50—no par.	47½	35½	48½
Gen. G. & E. (Del.) pf. A $8—no par	135	125	144
Gen. G. & E. (Del.) pf. A $7—no par	118	110	120
Gen. G. & E. (Del.) pf. B $7.	114½	105½	114½
Gen. Pub. Serv., $7 pf.	117	110	120
Gen. Pub. Serv., com., no par	29	16½	29
General Public Utilities, $7 pf.	*k*113	98	101
Ga. Lt., Pwr. & Rys. com.	*k* 58	55	65
Gt. Western Pwr., 7% pf.	*h*105	....	....
IDAHO PWR., 7% pf.	110	109	111½
Ill. No. Utilities, 6% pf.	*k* 99	96	100
Ill. Pwr. & Lt., 7% pf.	105	103	107
Indianapolis Pwr. & Lt., 6½% pf.	105½	102	107½
Indianapolis Pwr. & Lt., $7 pf.	102	100	105
Ingersoll Rand com.	97½	90	98
Int. Combus. Engr., com. $2—no par	65	45½	65
Int. Combustion Engr.,7% pf.	105½	103	105½
Int. Util., Class A—$3.50—no par.	51½	44½	52
Int. Utilities, Class B—no par.	14½	6½	16½
Interstate Pwr., pf.—$7—no par.	103	99	103½
Interstate Pub. Serv., 7% pf.	106	103	106½
Iowa Ry. & Lt., 7% pf.	101	.02	103
JERSEY CENTRAL PWR. & LT. CO., 7% pf	108	105	107
Johns-Manville, com.†—no par.	122½	111½	133½
Johns-Manville, 7% pf.	*m*122½	119½	121½

Stock Exchange: *a*Chicago; *b*St. Louis; *c*Philadelphia; *d*Boston; *e*Baltimore; *f*Montreal; *g*Cincinnati; *h*San Francisco; *i*Pittsburgh; *j*Washington. *k*Bid price Saturday, May 5. *l*Bid price Wednesday, May 9. *m*Latest quotations available. †Dividend rate variable.

Stock Quotations of Electric Light and Power and Manufacturing Companies (Continued)

(Prices on New York stock market unless otherwise noted. Unless otherwise noted the par, stated, or preference value of stock is $100.)

Companies	Bid Price Tuesday May 8	Low 1928	High 1928
KANSAS CITY POWER & LIGHT pf. $7	*f*113¾	111¼	114
Kansas Gas & Elec. 7% pf.	*f*110	107	110
Kelvinator Corp.	20½	11¼	22¾
Kentucky Hydro-Elec., 7% pf.	*k*104	100	105
Kentucky Sec., 6% pf.	95	94	98
Kentucky Sec., 5% com.	150	140	150
Kentucky Utilities, 6% pf.	105	100	105
LACLEDE GAS LT., 10% com.	*k*215	200	260
Lehigh Pwr. Sec., com.—no par	37¼	19¾	40
Long Island Ltg., 7% pf.	*k*111	110¼	112¾
Long Island Ltg., 6% pf.	*k*109	107	109
Long Island Ltg., com.†—no par	229	175	250
Los Angeles Gas & Elec., 6% pf.	*h*112	105¼	112¼
Louisville Gas & Elec., cl. A. $1.75	36¼	28	37¼
MAN. ELEC. SUPPLY, cap. $5—no par	53¼	50	61
Maytag Co., com. 50—no par	38¾	30	40¼
Memphis P. & L., pf.—$7—no par	110	109	111
Metropolitan Ed., pf.—$6—no par	100	103	109¼
Metropolitan Ed., pf.—$7—no par	109¼	109	111
Metropolitan Ed., com. $5—no par	*k*165	125	155
Middle West Utilities, 6% pf.	*a*100¼	93¾	100¼
Middle West Util., 6% pr. lien	*a*106¼	99	108
Middle West Util., com. $6—no par	*a*169	123¼	169
Midland Utilities, pr. ln. 6% pf.	*a* 95¼	94¼	97
Midland Utilities, 6% pf. A	*a* 90¾	89¼	92¼
Milwaukee Elec. Ry. & Lt., 7% pf.	105	100	106
Milwaukee Elec. Ry. & Lt., 6% pf.	100	98	110
Minn. Pwr. & Lt., 7% pf.	*f*108¾	107	109
Miss. River Pwr., 6% pf.	*k*112	94	112¾
Miss. River Pwr., 3% com.	112	....	....
Mohawk Hudson Pwr., 1st pf.—$7—no par	109¼	107¼	110
Mohawk Hudson Pwr., 2d pf.—$7—no par	107¼	105	108¼
Mohawk Hudson Pwr., com.—no par	53	29¼	53
Montana Pwr., 5% com.	175	102¾	175
Montreal Pwr., 7% com.	*f*112	....	....
Mountain States Pwr., 7% pf.	*k*104	97	105
Mountain States Pwr., com.†	18	....	....
NASSAU & SUFFOLK LTG., 7% pf.	110¼	98	110¼
National Carbon, 8% pf.	*a*136¾	136¾	139½
National Elec. Pwr., A†	*a* 38	27¼	32¾
National Lt., Ht. & Pwr., com.	*k* 24	20	30
National, Light, Ht. & Pwr., 5% pf.	72	70	80
National Pwr. & Lt., pf.—$6—no par	109	102	106
National Pwr. & Lt., com.†—no par.	36¼	21¾	36¼
National Pub. Serv., 7% pf.	102½	99	103
National Pub. Serv., 7% ptc., pf.	114	....	....
National Pub. Serv., A com. $1.60—no par	26¾	22	27¼
National Pub. Serv., B com.—no par	*m* 27¼	24¼	30
Nebraska Pwr., 7% pf.	*f*110¼	110	111¼
Nevada-Calif. Elec., com.	*k* 33	22	37
New Brunswick Pwr., 4% pf.	64	60	70
New Eng. Pub. Serv., pr. ln. pf. $7.	110	98¼	110¼
New Eng. Pub. Serv., pf. $7	98	95	108
New Orleans Pub. Serv.—7% pf.	107¼	106	110
N. Y. & Queens Elec. Lt. & Pwr., 5% pf.	102	91	100
N. Y. Central Elec., 7% pf.	105	101	105¼
New York Power & Light 7% pf.	114¼	....	....
NiagaraFalls Pwr., 7% pf.—25.	28¼	27¾	28¼
No. Amer., 6% pf.—50.	55	53¼	55¼
No. Amer., com.—10.	77¼	58¼	77¼
No. Amer. Edison, $6 pf.—no par	104	102¼	105¼
Northeastern Pwr., com.	27¼	19¾	30
No. N. Y. Utilities, 7% pf.	109	103	109
No. Ohio Pwr., com.—no par	29¼	18	29¼
Northern Ohio Pwr. & Lt., 6% pf.	99	90	99
No. Ont. Lt. & Pr. 6% pf.	*k* 99¼	94	100
No. Ont. Lt. & Pwr., 4% com.	*k* 72	73	78
No. States Pwr. (Del.), 7% pf.	110	108¼	110¼
No. States Pwr. (Del.), 8% com.	152	123	152
No. Texas Elec., 6% pf.	55	45	70
No. Texas Elec., com.	19	....	....
OHIO BRASS, com. B $4—no par.	95¼	89	100¼
Ohio Brass, 6% pf.	*k*105	106	111
Ohio Pwr., 6% pf.	109	104	109¼
Ohio Pub. Serv., $6 pf.	104	95	105
Ohio Pub. Serv., 7% pf.	112¼	107	112
Ohio River Edison, 7% pf.	109	106	109¼
Oklahoma Gas & Elec., 7% pf.	114¾	106	115¼
PACIFIC Gas & ELEC., 6% pf.	29¼	26¼	30
Pacific Gas & Elec., 8% new com.	52¾	43¼	53¾
Pacific Pwr. & Lt., 7% pf.	*f*111	106	110
Penn Cent. Lt. & Pwr., $5 pf.—no par	*c* 82	79¼	82
Penn-Ohio Edison, 6% pf. no par	99¼	93¼	100
Penn-Ohio Edison, 7% pf.	108	97¼	109
Penn-Ohio Pwr. & Lt., 7% pf.	111	....	....
Penn Pwr. & Lt.—$7—no par.	*f*109¾	109¼	110¼
Penn Wtr. & Pwr., $2.50 com., new	*e* 89	68	90
Phila. Co., 5% pf.—50.	48¼	45¼	48¼
Phila. Co., 6% pf.—50.	56	52	57
Phila. Co., com.—50.	*k*174¼	145	174¾
Phila. Elec., 8% com.—25.	*c* 74¼	55¼	74¾
Portland Elec. Pwr., 7% pf.	103½	100	104¼
Portland Elec. Pwr., 6% pf.	95	78	96
Portland Elec. Pwr., 6% 2d pf.	83	55	88
Portland Elec. Pwr. com.	43	....	....
Potomac Elec. Power, 6% pf.	*f*113½	....	....
Pwr. Sec., pf.—no par.	60	50	68
Pwr. Sec., com.—no par.	14	11	14¼
Public Serv. of Colorado, 7% pf.,	105	....	....
Pub. Serv. of N. J., 6% pf.	113½	103¾	115
Pub. Serv. of N. J., 7% pf.	*k*127	118	127
Pub. Serv. of N. J., $2 com.—no par	65¾	41¼	66¾
Pub. Serv. of No. Ill., 6% pf.	*a*113	110	115
P. S. of No. Ill., com. $8—no par.	*a*183	159¼	183
Pub. Serv. of No. Ill., $8 com.	*a*181¼	159¾	181¼
Pub. Serv. of Okla., 7% pr. ln.	109	100	107
Pub. Serv. Elec. & Gas, 6% pf.	110	108	110¼
Puget Sound Pwr. & Lt., 7% pf.	*k*110	105	109
Puget Sound Pwr. & Lt., $6 pf.—no par.	*k*103	93¼	105¼
Puget Sound Pwr. & Lt., com.	77	34¼	84¼
RADIO CORP. OF AMER., $3.50 pf.—50.	57¾	54¼	57¾
Radio Corp. of Amer., com.—no par.	209	85¼	209
Rochester Gas & Elec. 6% pf. D.	105¼	105¼	106¼
Rochester Gas & Elec., 7% pf. B.	107¼	105	107
Rochester Gas & Elec., 6% pf. C.	105¾	105¼	106¼
SAN JOAQUIN Lt. & Pwr., 7% pr. pf.	117	110	117¼
St. Joseph Ry., L., H. & P., 5% pf.	*k* 75	70	75
Servel, Inc.	14¼	4¼	14¼
Sierra Pacific Elec., 2% com.	40	29	40
Sioux City Gas & Elec., 7% pf.	106	100	108¼
Southeastern Pwr. & Lt., pf.—$7 no par.	*k* 109	....	....
Southeastern Pwr. & Lt., ptc. pf.	*l* 91¼	....	....
Southeastern Pwr. & Lt., com.—no par.	58¼	40¼	61
So. Calif. Edison, 8% pf.	49	38¼	41
So. Calif. Edison, 7% pf.	29	27¼	29¼
So. Calif. Edison, 6% pf.	27¼	25¾	27¾
So. Calif. Edison, 8% com.	51¼	43¼	53¼
Southern Cities Utilities, 7% pf.	85	75	87
Southwestern Lt. & Pwr., A $3.	80	60	80
Southwestern Lt. & Pwr., B.	65	60	65
Southwestern Lt. & Pwr., $6 pf.	94¼	88	96¼
Southwestern Pwr. & Lt., 7% pf.	114	110	114¼
Standard Gas & Elec., 8% pf.	70¼	65	71
Standard Gas & Elec., 7% pr. pf.	114¼	108	115
Standard G. & E., com. $3.50.	74¼	57¼	74¼
Standard Power & Light, com.	46	29¼	49¼
Standard Pwr. & Lt., 7% pf.	106¼	103¼	107¼
Staten Island Edison, pf.—$6—no par.	102¼	99	103¼
Superheater, $6 com.—no par	155	155	178
Syracuse Lighting, 7% pf.	110	103	112¾
Syracuse Lighting, 8% pf.	*k*117¼	114	119
TAMPA ELEC., com. $2.	69¼	62	71
Tenn. Elec. Pwr., 6% pf.	103	92	103
Tenn. Elec. Pwr., 7% pf.	109¼	107	110
Terre Haute, Ind. & East. Trac., 5% pf.	*k* 10	....	....
Terre Haute, Ind. & East. Trac., com.	*k* 1	1	3
Tex. Pwr. & Lt., 7% pf.	*f*114¼	113¼	115
Tide Water Pwr., 8% pf.	111	108	112
Timken Roller Bear., com.—$4 no par.	128¼	112¾	134
Toledo Edison, 7% pf.	109¼	108	111
Toledo Edison, 6% pf.	105	95	105
Toledo Edison, 6% com.	*k*145	120	150
Tri-City Ry. & Lt., 6% pf.	90	88	102
UNITED GAS & ELEC., 7% pf.	95	98	103
United Gas & Elec. (N. J.), 5% pf.	75	70	77
United Gas Impr., 8% com.—50.	*c*149¼	114¼	149¼
United Lt. & Pwr., pf.—$4—no par.	*a* 57	53	58
United Lt. & Pwr., pf.—$6.50—no par.	101	94¼	103¼
United L. & P., com. A .48—no par.	*a* 25	14	25¼
United L. & P., com. B .48—no par.	*k* 29¼	20	29¼
Utah Pwr. & Lt., 7% pf.	*f*112¼	109¼	112
Utica Gas & Elec., 7% pf.	105¼	105	106¼
Utica Gas & Elec., 8% com.	*k*200	215	225
Utilities Pwr. & Lt., 7% pf.	101	98	103
Utilities Pwr. & Lt., com. A $2.	38¼	28¼	39¼
Utilities Pwr. & Lt., com. B $1—no par.	29¼	18¼	30¼
VERMONT HYDRO-ELEC., 7% pf.	100	95	102
Virginia Elec. & Pwr., 7% pf.	*k*110¼	108	111
Virginia Public Service 7% pf.	102¾	97	103¼
WAGNER ELEC., 7% pf.	*b*104	96¼	105
Wagner Elec., com.—no par.	*b* 87¼	37	87¼
Washington Ry. & Elec., 7% com.	*j*450	....	....
Washington Ry. & Elec., 7% pf.	*j*102	....	....
Washington Wtr. Pwr., 8% com.	227	175	235
West Penn Elec., 7% pf.	114	109¼	115
West Penn Elec., Cl. A $7.	*k*110¼	106¼	112
West Penn Pwr., 7% pf.	115¾	114¼	117
West Penn Pwr., 6% pf.	110	108¾	113
West Virginia Lt., Ht. & Pwr., 7% pf.	*k* 95	94	100
Western Pwr., 7% pf.	103	98	105
Western States Gas & Elec., 7% pf.	*k*104	100	106
Western States Gas & Elec., com.	*m* 38	....	....
Westinghouse Elec. & Mfg., 8% com.—50.	110	88¼	112
Weston Elec. Instrument, Cl. A $2—no par.	*k* 33¼	30¼	34¼
Weston Elec. Instrument, com.—no par.	17¼	12¼	18¾
Wheeling Elec., 6% pf.	108	98	109
Worthington Pump, 7% pf. A.	*k* 56¼	46¼	58¼
Worthington Pump, 6% B.	*k* 49	41	51
Worthington Pump, com.	33¼	28	35¼
YALE & TOWNE [com. '$5—25.	78	68¼	84¼

Stock Exchange: *a*Chicago; *b*St. Louis; *c*Philadelphia; *d*Boston; *e*Baltimore; *f*Montreal; *g*Cincinnati; *h*San Francisco; *i*Pittsburgh; *j*Washington. *k*Bid price Saturday, May 5. *l*Bid price Wednesday, May 9. *m*Latest quotations available. †Dividend rate variable.

sinking fund mortgage gold bonds of the Pomerania Electric Company, which serves the Prussian Province of Pomerania as well as portions of adjoining provinces. The bonds, dated May 1, 1928, and maturing May 1, 1953, were priced at 92½ and interest, yielding over 6.60 per cent.

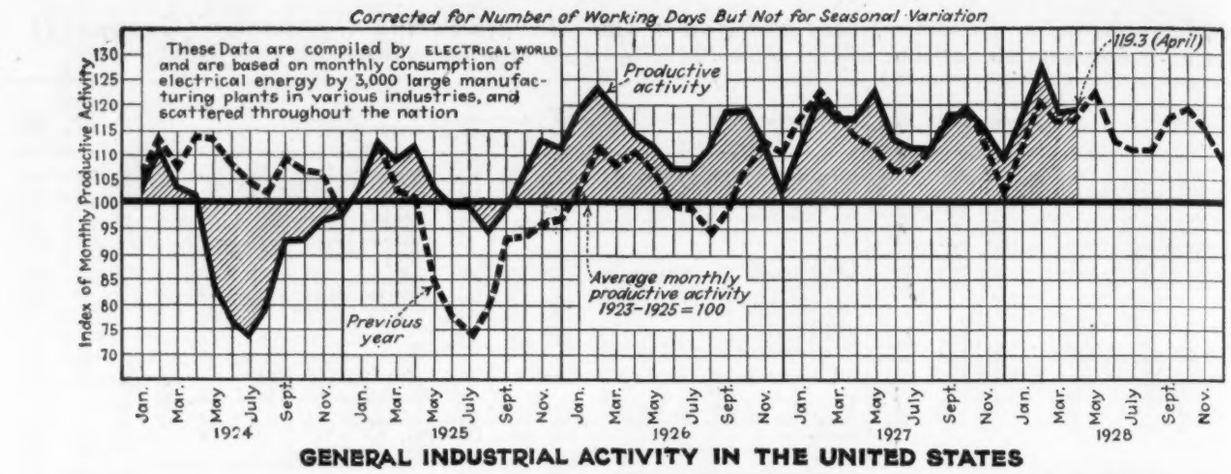
Customer-Ownership Sales

Somewhat less than average activity in customer-ownership campaigns is reflected in the reports of sales for January, and a further reduction occurred in February. In the former month the total value amounted to $16,171,029, the number of shares sold was 281,167 and the transactions 21,351. February sales of 154,306 shares, valued at $8,856,012, were made in 15,930 transactions.

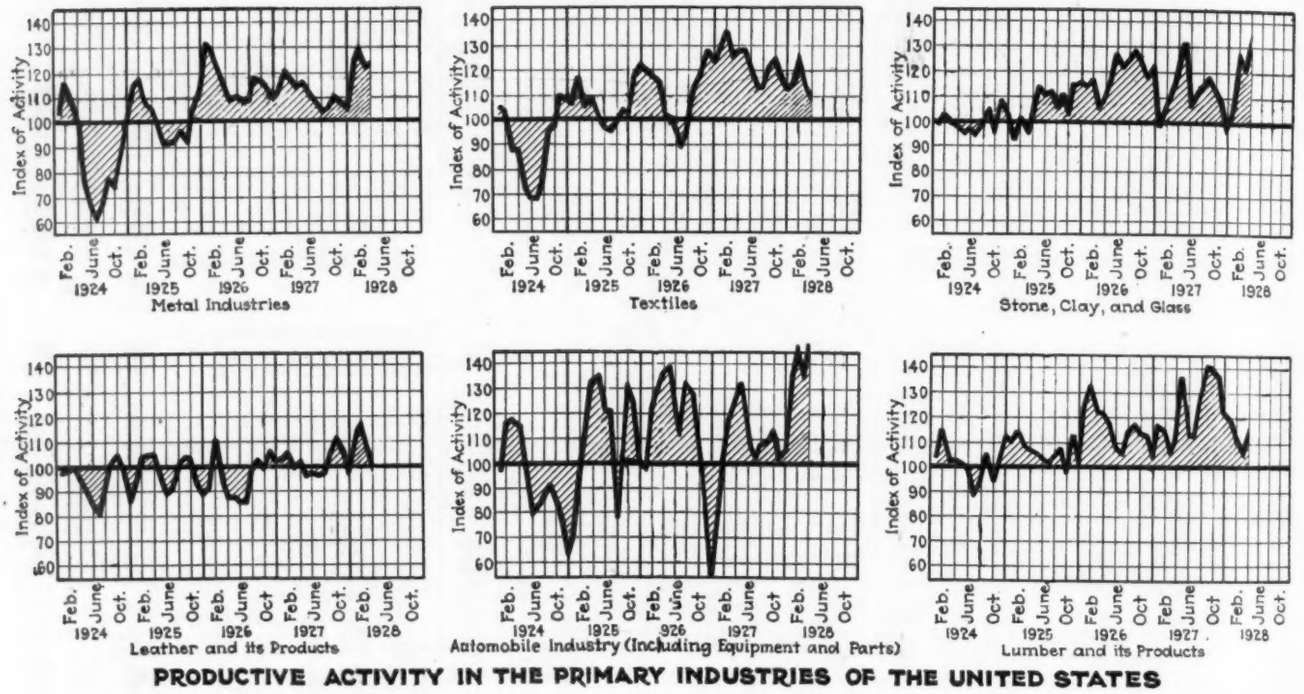
January sales were virtually equal in value to those of December, and exceeded those of the four lowest months in the second half of 1927, but were in turn exceeded in October and November. February sales were somewhat below those of August, the last previous low month. The average amount per transaction was $760 in January and $555 in February. Neither of these figures is exceptional. These sales, in the nature of the case, fluctuate widely from month to month. It is of interest, though, that in January nine companies reported sales aggregating $500,000; in February there were only four.

LOUISVILLE GAS STOCK CHANGES.—Louisville Gas & Electric shareholders will consider at their annual meeting, May 18, a recommendation that class A stock be made non-callable and classes A and B share equally in any dividends declared after the payment of quarterly dividends at the rate of $1.50 a share on both stocks.

GENERAL ELECTRIC ELECTS NEW DIRECTOR.—Henry C. McEldowney, president of the Union Savings Bank and Union Trust Company, both of Pittsburgh, was elected a director of the General Electric Company at the organization meeting of the board held May 8 at Schenectady. The stockholders of the company at their annual meeting authorized the additional director, increasing the total from twenty to twenty-one. Other directors were re-elected. Mr. McEldowney is a director of the Mellon National Bank of Pittsburgh and of the Pittsburgh Chamber of Commerce.


Corrected for Number of Working Days But Not for Seasonal Variation
These Data are compiled by ELECTRICAL WORLD and are based on monthly consumption of electrical energy by 3,000 large manufacturing plants in various industries, and scattered throughout the nation
Productive activity
119.3 (April)
Average monthly productive activity 1923-1925=100
Previous year
Index of Monthly Productive Activity
Jan. Mar. May July Sept. Nov.
1924 1925 1926 1927 1928

GENERAL INDUSTRIAL ACTIVITY IN THE UNITED STATES



PRODUCTIVE ACTIVITY IN THE PRIMARY INDUSTRIES OF THE UNITED STATES

Increased Productive Activity in April

THAT the present general optimism in business and industry which is prevalent in most sections of the nation is but a reflection of the individual operations is indicated by the consumption of electrical energy. Reports of energy consumption in April made to ELECTRICAL WORLD by some 3,000 large manufacturing companies reveal that the rate of industrial production in the first month of the second quarter of the year was close to 1 per cent greater than that witnessed in March and about 2.2 per cent over April of last year. Industrial operations are being well sustained, some of the outstanding industrial groups recording increased operations, when a slight seasonal decrease would be expected normally. The favorable industrial situation is reflected by the fact that during the first four months of the current year the average rate of activity of general industry was about 3.7 per cent above that during the same period in 1927.

The index of activity in general industry based on consumption of electrical energy stands at 119.3 for April, as compared with 118.2 in March. Comparative indexes of productive activity referred to the average activity for the period 1923-25 as 100 and adjusted for number of working days are as follows:

April, 1928	119.3
March, 1928	118.2
April, 1927	116.9
Average first four months 1928	120.9
Average first four months 1927	116.5

The most favorable aspects of the general industrial situation are to be found in the operations of the metal-working plants, the automobile manufacturing industry, which is but a branch of the metal-working industry, and in the stone, clay and glass industrial group. The ferrous and non-ferrous metal working plants reported a 3.5 per cent increase in operations during April and are operating on a plane about 14 per cent above last year. The automobile manufacturing plants, including replacement parts production, reported a 9 per cent increase during April over March, or at a rate 17 per cent above April last year. The stone, clay and glass group was up 10.3 per cent over March, or 14 per cent above April, 1927. On the unfavorable side must be placed the textiles industry, which reported a material drop in rate of operations during April, to a rate almost 15 per cent under April last year. The paper and pulp mills reported operations about 3 per cent under those of the month of April, 1927.

HYDRO-ELECTRIC SECURITIES OFFICERS.—New officials of this corporation include Sir Herbert Holt, chairman of the board, and Alfred Loewenstein, president. The board will include as new members J. H. Gundy, S. Godin, Jr., and Prentiss N. Gray. According to Mr. Loewenstein the corporation will shortly have a capital of about $57,000,000, as well as $30,000,000 of unsold preference A stock and about 500,000 common shares, which may be issued when the opportunity arises.

Business News and Market Conditions

Electric Truck Industry Holds Conference in Chicago

The electric truck industry, composed of representatives of the transportation committee, Commercial National Section, N.E.L.A., its truck operation subcommittee, the electric street and industrial truck manufacturers' committees of the Society for Electrical Development, and the Electric Transportation Club of Chicago, met in a successful conference in Chicago recently. One all-day session was devoted to market development possibilities and sales programs were discussed. The purpose of the conference, which was to bring the truck manufacturers and the power companies more closely together in the common problem of promoting electric transportation, was outlined by John F. Gilchrist, vice-president of the Commonwealth Edison Company. Reports on the status of the use of electric street and industrial trucks and plans for market broadening were presented by the following committee chairmen: L. M. Branch, Commonwealth Edison Company; F. H. Tinsley, Walker Vehicle Company; C. B. Cook, Ellwell Parker Electric Company, and G. E. Stringfellow, Edison Storage Battery Company.

A practical plan for central-station co-operation in the promotion of electric transportation was described by L. J. Lamberger, Duquesne Light Company, Pittsburgh, Pa., which company has recently created a special division in its sales department for this work. The central station and its relation to electric truck promotion in other cities was

Value and Destination of Electrical Exports for February, 1928, Compared with Corresponding Month in 1927

(Issued by Bureau of Foreign and Domestic Commerce)

Article	February 1927	February 1928
Generators:		
Direct-current:		
Under 500 kw.	$37,923	$50,469
500 kw. and over	38,671	130,092
Alternating current:		
Under 2,000 kva.	13,624	29,297
2,000 kva. and over	175,258	23,450
Steam turbine generator sets	30,100	81,822
Accessories and parts for generators	48,165	79,327
Self-contained lighting outfits	114,548	90,664
Batteries:		
Flashlight batteries	169,796	229,906
Other dry and wet cell primary batteries	161,617	218,613
Storage batteries	242,931	212,793
Transforming or converting apparatus:		
Power transformers	114,816	*
Power transformers, 500 kva. and over	*	118,452
Distribution transformers, less than 500 kva.	*	52,036
Other transformers	138,317	*
Instrument transformers	*	42,737
Other transformers, not elsewhere stated	*	38,474
Battery chargers under 15 amp.	*	17,418
Rectifiers, double current and motor generators, dynamotors, synchronous and other converters	75,104	65,335
Transmission and distribution apparatus:		
Switchboard panels, except telephone	49,880	142,250
Switches and circuit breakers over 10 amp.	117,990	162,443
Fuses and fuse blocks	18,714	30,988
Watt-hour and other measuring meters	16,149	74,637
Volt, watt, and ampere meters, and other recording indicating, and testing apparatus	174,482	*
Electrical indicating instruments	*	26,058
Electrical recording instruments	*	10,189
Other electrical testing apparatus	*	70,408
Lightning arresters, choke coils, reactors, and other protective devices	61,167	67,460
Motors, starters and controllers:		
Motors, under 1 hp.	$161,886	*
Motors ¼ hp. and under	*	$153,020
Motors over ¼ hp and under 1 hp	*	61,970
Stationary motors:		
1 to 200 hp.	204,576	188,870
Over 200 hp.	14,639	5,049
Railway motors	84,642	10,193
Electric locomotives:		
Railway	20,920	11,852
Mining and industrial	29,130	102,465
Station and warehouse electric motor trucks	2,438	16,647
Starting and controlling equipment:		
For industrial motors	92,534	181,062
For electric railway and vehicle motors	4,180	2,497
Portable electric tools	70,188	88,728
Accessories and parts for motors	157,910	165,524
Electric appliances:		
Electric fans	74,515	83,556
Electric lamps:		
Metal filament	95,615	123,424
Other electric lamps	23,793	36,759
Flashlights	202,606	167,707
Searchlights and projectors	23,397	28,261
Motor-driven household devices	153,003	*
Electric vacuum cleaners	*	68,785
Other motor-driven devices except tools	*	71,349
Electric flatirons	*	14,822
Domestic heating and cooking devices	113,956	*
Electric cooking ranges	*	21,015
Other domestic heating and cooking devices	*	76,924
Industrial electric furnaces and ovens	28,675	14,300
Therapeutic apparatus, X-ray machines, galvanic and faradic batteries, etc.	139,569	115,441
Signal and communication devices:		
Radio apparatus:		
Transmitting sets and parts	17,039	23,134
Receiving sets	203,367	189,877
Tubes	67,718	78,106
Receiving-set components	150,817	148,168
Receiving-set accessories	129,295	124,067
Telegraph apparatus	$87,785	$35,937
Telephone apparatus:		
Telephone instruments	28,702	21,030
Telephone switchboards	127,870	17,903
Other telephone equipment	183,091	393,623
Railway signals, switches and attachments	60,846	30,418
Bells, buzzers, annunciators and alarms	18,347	27,719
Other electric apparatus:		
Spark plugs, magnetos, and other ignition apparatus	126,646	*
Spark plugs	*	76,082
Other starting, lighting, and ignition equipment	*	49,350
Insulating material	96,455	112,976
Metal conduit, outlet, and switch boxes	85,068	120,009
Sockets, receptacles and lighting switches	149,354	145,539
Electric lighting fixtures, interior and street	119,322	*
Electric interior lighting fixtures	*	143,002
Electric street lighting fixtures	*	32,495
Other wiring supplies and line material	81,822	85,046
Other electrical apparatus, not elsewhere stated	624,639	557,970
Rubber and friction tape	30,507	25,264
Globes and shades for lighting fixtures	50,456	48,156
Electrical glassware except for lighting	24,012	40,467
Electrical porcelain:		
For less than 6,600 volts	58,200	42,832
For 6,600 volts and over	30,393	33,485
Carbons, carbon brushes and electrodes:		
Electrodes for electric furnaces	93,415	231,316
Other carbon products	140,888	82,183
Insulated wire and cable (iron or steel)	10,718	13,692
Copper, bare wire	202,321	190,753
Copper, insulated wire and cable	346,540	369,218
Refrigeration sets up to 1 ton capacity	161,515	368,513
Domestic washing machines	99,353	133,274
Totals	$7,103,934	$7,867,142

*Changes made in the classification.

DESTINATION OF ELECTRICAL EXPORTS

Country of Destination	February, 1928
EUROPE:	$1,764,912
Belgium	107,935
France	161,501
Germany	126,369
Italy	105,266
Netherlands	79,431
Spain	325,709
Sweden	27,241
United Kingdom	511,968
Other countries	319,492
WESTERN HEMISPHERE:	$4,330,290
Canada	1,729,690
Mexico	439,968
Cuba	240,678
Argentina	467,663
Brazil	475,674
Chile	244,589
Colombia	215,974
Peru	56,556
Venezuela	98,393
Other countries	361,105
ASIA, AFRICA AND OCEANIA:	$171,940
British India	139,643
China	109,662
Japan	353,899
Philippine Islands	134,217
Australia	443,167
New Zealand	146,306
Union of South Africa	91,457
Other countries	353,589

outlined by C. R. Skinner, New York Edison Company; F. E. Nelson, Indianapolis Power & Light Company; H. S. Greiner, Minneapolis General Electric Company; F. S. Dewey, Kansas City Power & Light Company; E. L. Huston, Union Gas & Electric Company, Cincinnati, and D. F. Estes, Commonwealth Edison Company, Chicago.

Use and application of electric trucks for utility transportation problems were discussed by A. H. Gossard, Middle West Utilities Company; Secor Cunningham, Commonwealth Edison Company; H. P. Sedwick, Public Service Company of Northern Illinois, and J. R. Coxen, Consolidated Gas Company. On Friday the conference was given over to inspection of the use of electric trucks by the Commonwealth Edison Company and various industrial installations in Chicago. Sixty-eight representatives of the electric truck industry and utility companies attended the conference and it was felt that through the conference a new impetus had been given to the promotion of electric street and industrial truck transportation.

Market Conditions

MATERIAL for extending service lines makes up an important part of the business in New England. Orders are mainly in small lots with the activity general. Industrial equipment buying is limited to small motor orders, of which a fair volume is maintained. In the Eastern district there is an increasing demand for industrial equipment. Transportation companies are looming up as an important factor in the electrical business. A New York utility company has ordered $70,000 worth of paper-insulated cable and $30,000 worth of substation apparatus. A company in northern New York also purchased $30,000 worth of switching equipment.

Continued rains have delayed construction work and crop planting in the Southeast, but business is satisfactory, although there is some pessimism in the rural sections. A slight improvement is recorded in the St. Louis district and there has been a marked improvement in the demand for medium-sized motors. A great deal of underground construction work is under way in the Middle West as well as a considerable amount of building, particularly larger structures. On the Pacific Coast varied machinery orders were placed. Lumber mills in the Puget Sound district are working on a five-day week.

Copper Price Strengthens—Sales Excellent

Copper sellers did an excellent business with virtually all of it being done on the basis of 14.25 cents Connecticut. Zinc, though not particularly active, has commanded better prices and 6 cents has been realized on several sales for future delivery. Lead and tin have both been quiet and occasional shading of the prices for lead that have prevailed for some weeks is reported. Tin sagged slightly but was a little firmer on Wednesday.

NEW YORK METAL MARKET PRICES

	May 2, 1928 Cents per Pound	May 9, 1928 Cents per Pound
Copper, electrolytic	14.025	14.025–14.05
Lead, Am. S. & R. price	6.10	6.10
Antimony	10.375	11¼
Nickel, ingot	35.00	35
Zinc spots	6.225	6.325
Tin, Straits	51½	51.875
Aluminum, 99 per cent	24.30	24.30

Base copper wire price May 9, 1928, 16 cents.

Service Expansion Promotes New England Sales

Extension of service lines throughout New England is promoting sales. Buying of poles, wire, disconnecting switches and control equipment is recorded. Orders for small lots dominate the tone, among which are noted material for southern New Hampshire amounting to about $2,000. An order for disconnecting switches and accessories, amounting to $3,000, for a prominent power company and a number of insulator orders ranging from 200 to 1,000 lots were reported. A distributor reports that the general tone of business is steady and last month's sales were encouraging. New work centers about a number of line extensions planned for central and northern Maine, bids for which will be received soon.

Industrial equipment buying is limited to small motor orders, of which a fair volume is maintained. A few of the larger ratings up to 50 hp. are in demand and a number of loom motors were recently purchased. Heavy equipment buying is lagging, and negotiations are quiet. Special equipment is attracting attention. One company recently placed twelve motor-driven woodworking machines in a well-known institute. Small heating furnaces also are receiving attention. Appliance sales are steady and outdoor electric lighting and display signs are being promoted through special campaigns. Construction projects are as follows:

The Connecticut Light & Power Company, Waterbury, Conn., plans a repair and distributing plant to cost $200,000. The Baird Machine Company, Stratford, Conn., plans an addition to cost $85,000. The Boston Elevated Railway, Boston, plans a substation on Warren Street to cost $40,000. The Boston & Maine Railroad will make improvements in the car repair shops at Keene, N. H., to cost $175,000.

Chicopee Center, Williamsett and Aldenville, Mass., plan ornamental lighting systems.

Industrial Business Better in Middle West

Reports from agricultural districts in the Middle West are encouraging and industrial activity has accelerated somewhat. A considerable amount of building is under way, particularly larger structures. The utility companies are extremely busy, and a great deal of underground construction work is being done. Interesting orders include one for 250 distribution transformers in assorted sizes, one 55,000-kw. reheat turbine generator complete with appurtenances, 50,000 lb. copper bus bar, a quantity of disconnecting switches, circuit breakers and relays, and several construction orders-totaling $50,000. Jobbers' sales are somewhat spotty. Considerable business is being obtained from railroad and municipal sources. Construction plans are as follows:

The Container Corporation of America, Chicago, plans a paper board mill to cost $300,000. The Chevrolet Motor Company plans an addition to its power plant at Detroit, Mich., to cost $100,000. The Patterson Foundry & Machine Company, East Liverpool, Ohio, plans an addition to cost $100,000. The Wisconsin Power & Light Company, Madison, Wis., plans a power plant on Yellow River, near Necedah, Wis., to cost $250,000. Emmetsburg and Indianola, Iowa, and Marquette, Mich., plan ornamental lighting systems.

Rains Delay Construction in Southeast—Sales Fair

Despite continued rains which have delayed construction and considerably delayed the planting of crops, which latter fact is causing some pessimism in the rural sections, conditions in the Southeast are healthy and the volume of electrical business is satisfactory. A Tennessee company ordered copper wire and cable amounting to $5,000 and another company in the same state purchased power transformers aggregating $5,000. Another order for small power transformers came from a Georgia company and amounted to $4,000. Some other central-station orders included $5,000 worth of insulators and $3,300 worth of small switching equipment.

A silk mill under construction in Tennessee ordered copper wire and cable amounting to $15,000, and substation equipment amounting to approximately $10,000 for a rock quarry in Georgia will be ordered in the very near future. A new cement mill will be constructed in Georgia and material contracts will soon be let. Approximately $90,000 of motors, switchboard, transformers and wiring materials will go into that job. Construction projects are as follows:

The South Georgia Power Company, Albany, Ga., has purchased the municipal system in Rochelle and will connect with a transmission line. The Marianna Lime Products Company, Marianna, Fla., plans a cement mill at White Cliffs, Ark., to cost $500,000. The Shellabarger Mill & Eleva-

tor Company, Salina, Kan., will build a grain elevator to cost $350,000. The Kemper Military School, Boonville, Mo., plans an addition to its power plant. Swift & Company, Chicago, will install a cold storage plant at St. Louis to cost $400,000. Frederick E. Kern, Syndicate Trust Building, St. Louis, and associates, plan a fire brick and refractory plant, to cost $350,000.

The Laclede Power & Light Company, St. Louis, plans a switching station at Mound Street to cost $40,000. Anheuser-Busch, Inc., St. Louis, plans extensions in its power plant to cost $200,000. The Union Electric Light & Power Company, St. Louis, plans a substation on Clark Street to cost $45,000. The Dry Kold Products Company, 69 Neron Place, New Orleans, La., plans plants at Dallas and other points in Texas and Louisiana to cost $1,000,000. The Hahn Packing Company, Dallas, Tex., plans a rendering and packing plant to cost $100,000. Vernon, Tex., will build a power plant to cost $25,000. Brownsville, Tex., will build a substation, to cost $22,000. Houston, Tex., plans an improved lighting system on a number of streets.

Industrial Plants Buying in Eastern District

Increasing demand for electrical equipment for industrial service is a feature of the market in the Eastern district. A recently organized rayon company will soon place orders for a considerable quantity of equipment for a $4,000,000 mill in Georgia. A nitrogen company in northern New York has contracted for industrial heating equipment to cost about $25,000. A steel chain manufacturing plant at Albany will make purchases for a new mill unit to cost close to $500,000.

Transportation account looms as an important consumer within a short time; New York will soon ask bids for equipment for two specimen subway trains of improved type, and a steam railroad has placed an order for parts, for reconditioning electric locomotives, to cost $40,000, and a contract for air compressors to cost $30,000. The electrification of the New York west side lines of the New York Central Railroad is scheduled to proceed at an early date, the cost to aggregate several million dollars and other New York Central plans are being rumored; plans for electrification of suburban lines of the Lackawanna Railroad, to cost $15,000,000, will soon be issued, and manufacturers are awaiting an opportunity to quote on requirements. The Reading Company, Philadelphia, also will make purchases for its $20,000,000 electrification program.

Central-station account is growing inactive in the Eastern district and the bulk of present business centers in miscellaneous and auxiliary apparatus. A New York utility has contracted for paper-insulated cable to cost $70,000, also for switches and protectors for substation service to cost about $30,000. A power company in Northern New York has placed a commitment for switching and accessory equipment to cost about $30,000. A new Jersey central station has been making purchases of transformers and other substation apparatus for several sizable projects and is expected to give additional contracts at an early date. A leading manufacturer of waterwheels states that current business for impulse type units is lower than that of a year ago at this time, owing largely to the falling off in demand on the Pacific Coast. Export sales of waterwheels are improving, with South American utilities prominent in the market. Construction activities in the Eastern district are as follows:

The New York Edison Company plans a substation to cost $450,000. The Ramsey Chain Company, Albany, N. Y., plans a plant to cost $500,000. The Liberty Construction Stone Company, New York, will build a plant to cost $100,000. The Eastern States Milling Corporation, Buffalo, N. Y., plans a grain mill to cost $200,000. The Oswego Candy Company, Oswego, N. Y., plans a factory addition to cost $100,000. The American Chatillon Company, New York, plans a new rayon mill at Rome, Ga., to cost $4,000,000.

The Gates-Day Aircraft Corporation, Paterson, N. J., will build a plant to cost $100,000. The Public Service Electric & Gas Company, Newark, N. J., plans a substation at Camden, N. J., to cost $500,000. The Anti-Hydro Waterproofing Company, Newark, N. J., will build an addition to cost about $100,000. The Philadelphia Rapid Transit Company, Philadelphia, plans a motor bus repair shop to cost $250,000. E. H. Reuss, Jr., Philadelphia, plans a pipe-bending and manufacturing plant to cost $200,000. The Bethlehem Shipbuilding Corporation, Baltimore, Md., will build a second unit to cost $500,000.

Varied Machinery Orders Placed on Pacific Coast

Many interesting and varied machinery orders are reported on the Pacific Coast. They include 96 distribution transformers and a lot of lightning arresters and insulators having a total value of $15,000 for the Truckee Carson irrigation project, six 100-kva. subway transformers, valued at $5,000, for Pantages theatre, Fresno, thirteen assorted induction motors, valued at $2,500, for a Hawaiian sugar plantation, one carload assorted pin-type insulators, valued at $6,000, for a manufacturer of outdoor switches, one carload 11,000-volt pin-type insulators, valued at $6,500, for San Joaquin Valley extensions, 20 assorted motors, valued at $6,000, for a Bay district industrial plant and 200 transformers for power company stocks.

Lumber mills in the Puget Sound country, affiliated with the West Coast Lumbermen's Association, have agreed upon a curtailment program providing for a five-day week operation for an indefinite period. Previous to this action, several large mills in the Grays Harbor district closed down voluntarily and large mills in Tacoma abolished night shifts. The Weyerhaeuser Timber Company, Longview, Wash., is expected to award contracts in a few days for turbines and other equipment. Sales reported include about $10,000 worth of switchgear to a central-station company in Thurston county, ten 25-hp. motors for a Seattle can company and about fifty motors to lumber mills and allied industrials. Construction plans in the district are:

The San Francisco Produce & Provision Terminals, Inc., San Francisco, plans a warehouse and cold storage plant to cost $2,500,000. The Security Warehouse & Cold Storage Company, Santa Clara, Calif., plans a cold storage plant, to cost $150,000. The Empire Zinc Company, Belden, Colo., plans a milling plant to cost $250,000. The Black Hawk Consolidated Mines Company, Silver City, N. M., will build a milling plant to cost $100,000. The Oregon-Washington Railroad & Navigation Company, Portland, Ore., will make additions in its car and locomotive shops to cost $133,000.

The Wyoming Carbonizing & Briquetting Company, Kemmerer, Wyo., plans a new plant at Conroy, Wyo., to cost $150,000. The Western Public Service Company, Colorado Springs, Colo., plans additions to its power plant at Laramie, Wyo., to cost $76,000. The Public Service Company of Colorado, Denver, plans extension in transmission lines and distributing system at Alamosa, Colo., and vicinity. The Bureau of Reclamation, Denver, Colo., will receive bids until May 25 for construction of 19.1 miles, 66,000-volt, single-circuit wood pole, transmission line, and 13 miles single-circuit telephone line, near Adrian and Nyssa, Ore. Madera, San Jose, North Hollywood, Berkeley, San Diego, Santa Paula, Long Beach and Los Angeles, Calif., plan ornamental lighting systems.

Slight Improvement Recorded in St. Louis District

Conditions show a slight improvement in the St. Louis district. There has been a marked increase in the demand for medium-sized motors and transformers, also meters and lightning arresters. One order, including 2,000 kva. of transformers with substation equipment amounted to $16,000 and was for use in the Southwest. Manufacturers report a good volume of business in domestic and heavy-duty ranges. One contract for a baking oven to cost $2,000 was placed. An order for a bank of transformers was placed by an industrial company at a cost of $2,500. The southern part of the district has shown the greatest activity of late. Construction activities are as follows:

The Bemis Brothers Bag Company, St. Louis, plans a cotton mill near Talladega, Ala., to cost $1,500,000. The Florida Power Corporation, Ocala, Fla., plans a Diesel engine power plant at Mayo, Fla., to cost $100,000. The Inland Utilities Company, Kansas City, Mo., plans a power plant at Blue Mountain, Miss., to cost $75,000. The Southern Fruit Company, Inc., Charlotte, N. C., plans a cold storage plant to cost $100,000. The Airial Mill, Easley, S. C., will build a cotton mill to cost $150,000. The Gaffney Manufacturing Company, Gaffney, S. C., will build an addition to its textile mill to cost $200,000.

The Sani-Fold Corporation, Athens, Tenn., plans a furniture plant to cost $200,000. Cookeville, Tenn., plans extensions in its power plant to cost $150,000. The Arrington Cold Storage Corporation, Arrington, Va., will build a cold storage plant to cost $100,000. The Mississippi Power Company, Gulfport, Miss., is negotiating for the purchase of the municipal plant at Flora, Miss. The Mississippi Power & Light Company, Pine Bluffs, Ark., has acquired the municipal plant at Summit, Miss. Palmetto, Fla., and Richmond, Va., plan improved street lighting systems.

Activities of the Trade

Landers, Frary & Clark Celebrate 75th Anniversary

To celebrate its 75th anniversary in its corporate form Landers, Frary & Clark of New Britain, Conn., manufacturer of electric appliances, household hardware, etc., are offering to dealers during the month of May a special 10 per cent price reduction on all urns and percolators. The company, in a letter to its dealers, states: "In preparation for this May sale your regular source of supply will ship you one order of nickeled or silver 'Universal' electric urns or percolators separately or in sets with accessories at 10 per cent below your usual cost. This is in expectation that these specially priced goods will be offered to consumers at 10 per cent savings during the month of May only."

THE WAGNER ELECTRIC CORPORATION, St. Louis, announces the removal of its New York City branch sales office from 50 Church Street to 30 Church Street, Suite 1110. The New York City service station remains at 321 West 54th Street.

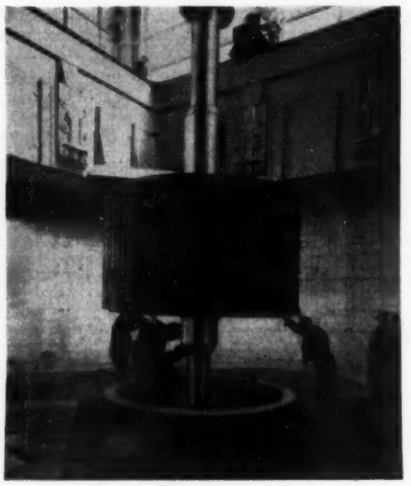
THE GENERAL ELECTRIC COMPANY announces the appointment of A. L. Jones as district manager in the Rocky Mountain region, with headquarters at Denver. Mr. Jones will supervise the sales in the nine states of the region with sub-offices at Butte, Mont., and Salt Lake City, Utah.

THE PERFECTION APPLIANCE COMPANY, Detroit, manufacturer of the Perfection electric ironer, a division of the Splitdorf-Bethlehem Electrical Company of Newark, N. J., announces that A. H. Graham, formerly campaign manager for the Servel Corporation in the Southeastern division, has joined its sales organization as special sales representative working out of the head office in Detroit.

THE DAMPNEY COMPANY OF AMERICA, Hyde Park, Boston, Mass., announces that the sale of its "Apexior" protective coatings for power plant equipment will be handled in Colorado, western Nebraska, eastern Wyoming and northern New Mexico by Joy & Cox Inc., 314 Tramway Building, Denver.

THE LINCOLN ELECTRIC COMPANY, Cleveland, manufacturer of "Linc-Weld" motors and "Stable-Arc" welders, announces the following changes and additions to its sales and welder service divisions. H. A. Stamper has been placed in charge of consumer motor sales and D. F. Titus in charge of welder service in the New York district under the direction of G. N. Gull, district sales manager; A. H. Kirkpatrick replaces D. W. Carver as manager of welder service in the Cincinnati district under M. R. Simpson, Mr. Carver having been transferred to the Cleveland district; H. E. Nelson will take charge of the consumer motor sales in the Cincinnati district; P. A. Ludwig has assumed charge of the welder service in Philadelphia and vicinity; Forrest Kessler has been transferred to the welder service division in the Cleveland district and J. R. Rothermel is in charge of welder service at Chicago under R. D. Malm, district manager, while W. Weaver has been placed in charge of the consumer motor sales in the Chicago district.

Overspeed Tests Made Safely in General Electric Test Pit



Lowering a 30,000-kw. waterwheel generator rotor into the new General Electric test pit.

THE ELECTRIC SERVICE SUPPLIES COMPANY, Seventeenth and Cambria Streets, Philadelphia, manufacturer of railway and power electrical material, announces the removal of its Chicago offices and warehouses to larger quarters at 111 North Canal Street, between Washington and Randolph Streets, directly opposite the Chicago & Northwestern depot.

THE CUTLER-HAMMER MANUFACTURING COMPANY, Milwaukee, manufacturer of electric controlling devices, announces a new toggle auto switch, designed to meet the severe requirements of truck and bus service.

THE CRAWFORD OVEN COMPANY, New Haven, Conn., announces that Robert M. Gantert, formerly associated with the Philadelphia Electric Company in developing bakery applications of electric ovens, has joined its sales organization. He will devote his time helping bakeries and food-products manufacturers in southeastern New York, New Jersey, Pennsylvania, Delaware, Maryland and the District of Columbia solve their oven problems. The Crawford Oven Company manufactures a complete line of traveling ovens for baking and industrial applications. The company, at an early date, intends to open an office in New York City in charge of Mr. Gantert.

THE TRICO FUSE MANUFACTURING COMPANY, Milwaukee, announces the removal of its Pittsburgh office to new and larger quarters at 405 Penn Avenue, in charge of W. A. Bittner.

THE OLIVER IRON & STEEL CORPORATION, Pittsburgh, announces the appointment of Nelson G. Craig as district manager at 1420 Walnut Street, Philadelphia. Mr. Craig will have charge of the bolt, nut, rivet and pole line material sales in the Philadelphia territory.

THE ELECTRIC FURNITURE CORPORATION and affiliated associated companies announce the opening of new showrooms in the St. Clair Building, Chicago, centrally located near the furniture mart. The Electric Furniture division has developed several distinct types of furniture equipped with a patented "Utilitap," a three-outlet tap mounted flush with the surface of the woodwork.

THE GENERAL ELECTRIC COMPANY, merchandise department, Bridgeport, Conn., announces that it is now marketing a line of "Textolite" attachment plugs.

PASS & SEYMOUR, INC., Solvay Station, Syracuse, N. Y., has placed on the market an intermediate base line of sockets and receptacles.

THE OLIVER IRON & STEEL COMPANY, Pittsburgh, announces that Bertram Quarrie has been elected president of the company to succeed Henry Oliver, who has become chairman of the board of directors. Mr. Quarrie was formerly connected with the American Steel & Wire Company and the Otis Steel Company at Cleveland. This corrects an item appearing in the April 21 issue of the ELECTRICAL WORLD in which it was stated that Mr. Oliver had resigned from the company.

THE YALE ELECTRIC CORPORATION, Pearl and Tillary Streets, Brooklyn, N. Y., manufacturer of flashlights and dry batteries, announces that the company is now established in its new million-dollar building at 257 Cornelison Avenue, Jersey City, N. J.

THE AMERICAN ELECTRIC SWITCH CORPORATION, Minerva, Ohio, announces that it has added another building to its factory. The new building comprises two floors and a basement and has a floor space of 26,000 sq.ft. The switchboard, panelboard, knife switch and shipping departments will occupy the new addition.

THE HYNES & COX ELECTRIC CORPORATION, 406 North Pearl Street, Albany, N. Y., manufacturer of "Red Crown" water heaters, announces that it is now manufacturing the "Duostat" automatic electric water heater. This is a low wattage storage type heater using two heating elements, each of which is controlled by its own thermostat.

THE TIMKEN ROLLER BEARING COMPANY, Canton Ohio, announces that W. H. Post has been appointed manager of the Pittsburgh branch of the service and sales divisions.

THE ERIE MALLEABLE IRON COMPANY, Erie, Pa., announces that since May 1 C. E. Collier has been in charge of its Western office, with headquarters at 911 Peoples Gas Building, Chicago, succeeding C. E. Callender, who has resigned.

THE G-Q ELECTRIC COMPANY, 208 Broadway, Milwaukee, jobber, announces the opening of a branch office at 531 West College Avenue, Appleton, Wis., which will serve the Fox River Valley.

New Equipment Available

High-Voltage Disconnect Switches

A line of group-operated disconnect switches for outdoor service in capacities of 600 and 800 amp. and voltages from 132,000 to 220,000 has been developed by the General Electric Company. These switches, which are intended for isolating oil circuit breakers on high-voltage, super-power systems, have short, fixed blades on insulators suspended from trucks. The trucks are moved backward or forward on ship channel frames. The stationary contacts are assembled on insulators suspended at the extreme ends of the frames. The contacts are of the spring-pressure line-contact type.

The manufacturer claims that this design permits a considerable saving in space over other types of switches using long swing blades. These switches are built in six-pole, single-throw and three-pole, single-throw types and carry the designations HD-1 and HD-2, respectively. Either manual or motor operation may be provided.

Fractional-Horsepower Direct-Current Motors

A line of fractional-horsepower direct-current motors in standard sizes from 1/6 hp. to ½ hp. at speeds corresponding to standard speeds of alternating-current motors has been placed on the market by the Century Electric Company, St. Louis. The field is a two-pole laminated steel structure. The compound-wound field coils are wound on forms, well insulated and taped. The armature slots are insulated with alternate layers of fish paper and varnished cambric. Hardwood wedges are used to retain the coils. Both field and armature coils are wound with cotton-enamel wire and thoroughly treated with insulating paints to withstand the dampness frequently surrounding installations in basements and humid tropical climates.

The bearings are made of cast phosphor bronze. The Century wool-yarn system of lubrication is used. The commutator, which is said to be of liberal size, is made from rolled copper bars and insulated with mica. The brushes are carried in a box-type brush-holder attached to the field frame and do not require adjustment during the life of the brushes.

Lift-Truck for Heavy Reels

A storage battery lift-truck designed especially for handling reels of wire or cable has been developed by the Lakewood Engineering Company, Cleveland. The truck has a capacity of 6,000 lb. and will handle reels up to 60 in. in diameter and 42 in. wide. The winches, which operate on a bar placed in the center of the cable reel, slide upward on the trunnions and wind in at the same time thus securing a double action.

GUIDE CLAMP.—A guide clamp which will prevent a conductor breaking as the result of crystallization close to the point where it is rigidly held to the connection member of an oil circuit breaker, transformer, or disconnecting switch has been placed on the market by the General Electric Company. The new guide clamp consists of a cast arm 4 to 6 in. long, provided with holes at each extremity for bolting to the conductor and terminal. Its function is to distribute the point of flexure over an appreciable length of conductor and thus to relieve the metal adjacent to the connecting stud of the full effect of vibration and swinging which often results in crystallization and ultimate failure. The clamp is made in a variety of sizes suitable for attachment to conductors in sizes from No. 2 up to 2½-in. iron pipe size copper tubing.

TENSION INDICATOR.—A tension indicator for determining tension in guy wires, messengers and line conductors has been placed on the market by the Martin-Loomis Corporation, Long Beach, Calif. The device is designed for use on wire from ¼ in. to 1¼ in. in diameter. It is not a dead-end instrument and can be installed on any line, either before or after tension is applied. Two rigid clamps on the main body 9 in. apart, through which the wire passes, are so made that the clamps swing to allow attachment to a line under tension. The tendency of the wire to resist being deflected between the two clamps exerts a pressure on a diaphram which is registered on a pressure gage. The instrument weighs only 12 lb.

Automatic Telemetering Device

An automatic telemetering device, recently placed on the market by the General Electric Company, covers the readings of meters and instruments in all parts of the power system, and indicates or records them on a single receiving apparatus located at some central point, such as the load dispatcher's office. The telemetering system operates over a single pair of wires, the receiver being actuated by impulses sent out by relays associated with the outlying meters. Since the readings are transmitted by impulses, ordinary variations in line wire resistance or battery voltages have no effect on the accuracy of the telemetering. Carrier current channels may be used to transmit the readings, and in cases telephone circuits may be employed, without imparing communication in any way. Where a large number of intermittent readings from a particular station are required, standard supervisory equipment is utilized.

The telemeter proper, located at the load dispatcher's headquarters, is an accurate speedometer calibrated in terms of the speed of the rotating meters at the sending end. It consists essentially of a motor connected by a spring coupling and gearing to a permanent magnet. The motor is allowed to make one revolution for each impulse received. This is transferred to the permanent magnet by means of a flexible spring coupling and gearing. Hence the magnet also makes a definite portion of a revolution for each impulse received. The dragging effect of the revolving magnet upon a disc, to which the dial hand or recording pen is attached, translates the impulses into readings proportional to the indication of the outlying meter.

Important readings such as voltage, amperes, kilowatts, reactive kilovolt-amperes, and frequency, may be transmitted in this manner from all parts of the system. The dispatcher may have either visual or recording equipment for receiving them. When kilowatts are transmitted, each impulse represents a definite number of kilowatt-hours. The telemetering device may therefore operate a demand meter or register kilowatt-hours on a dial. Kilowatts from several remote points may be totalized on one receiving meter.

DEVICE FOR LOCATING DEFECTS IN MACHINERY.—The "Transmit-o-phone" for locating defects in power plant machinery, motors, etc., and for locating leaks in pipe lines, hidden conduits or pipes, etc., has been placed on the market by the International Metal & Specialty Company, Berlin, N. J. The instrument has a variety of applications. It has been used to locate flooded conduits as well as to determine the exact cause and origin of the flooded conditions. The instrument is essentially a sensitive sound detecting device. The manufacturer also claims that the instrument can be used to locate defective electric meters.

Electrical Patents

Announced by U. S. Patent Office

(Issued April 24, 1928)

16,940 (reissue). THERMOSTAT; R. F. Massa, New York, N. Y. App. filed Nov. 11, 1913.

1,666,889. TRANSFORMER; J. Desloge, St. Louis, Mo. App. filed March 30, 1925. Bell-ringing type.

1,666,897. SHIP-GUIDANCE SYSTEM; J. H. Hammond, Jr., Gloucester, Mass. App. filed April 27, 1922. For indicating the relative positions of movable bodies whereby desired relative positions may be maintained.

1,666,904. TIME SWITCH; R. D. Malley, East Orange, N. J. App. filed Oct. 30, 1923. Mercury type.

1,666,916. ELECTRICALLY-OPERATED DOOR; H. Rowntree, Scarsdale, N. Y. App. filed Oct. 4, 1924.

1,666,923. PROTECTIVE DEVICE; W. W. Woodruff, Swarthmore, Pa. App. filed Nov. 3, 1922. Fusible cutout.

1,666,925. SWITCH CONSTRUCTION; R. B. Benjamin, Chicago, and C. E. Warner, Berwyn, Ill. App. filed Nov. 5, 1923. Toggle type.

1,666,970. ELECTROMAGNET; C. L. Jauss, Mexico, Mex. App. filed Sept. 23, 1925. Especially designed for the operation of locks.

1,666,973, 1,666,974. DOUBLE-CONTACT SOCKET FOR ELECTRIC LAMPS; F. J. Miles and D. C. Thompson, Newark, N. J. Apps. filed Nov. 14, 1924. For use with small incandescent electric lamps.

1,666,978. TERMINAL CONTACT CLIP; J. Sachs, Hartford, Conn. App. filed Dec. 12, 1921.

1,666,979. FUSIBLE SWITCH; J. Sachs, Hartford, Conn. App. filed Jan. 25, 1923.

1,666,980. CABLE HEAD; J. E. Sharp, Wheeling, W. Va. App. filed April 1, 1927. Head to be fastened over the eye in a steel snake with a view to enabling electricians to push the snake with facility through long stretches of conduit.

1,666,991. ELECTRICAL CONNECTER; S. Cohen, Neponsit, N. Y. App. filed Aug. 25, 1925.

1,667,018. BURGLAR-ALARM MOUNTING; P. V. Vandevelde, Corona, N. Y. App. filed April 13, 1926.

1,667,020. PRESSURE-RESPONSIVE DEVICE; O. G. Wendel, Buffalo, N. Y. App. filed Sept. 21, 1921.

1,667,021. TRANSLATOR OF ELECTRICAL ENERGY; H. M. Williamson, Chicago, Ill. App. filed Dec. 8, 1923. Wherein electrical impulses are translated into audible sound waves or into physical vibrations.

1,667,025. OUTLET-BOX HANGER; C. E. Bowers, Los Angeles, Calif. App. filed Oct. 21, 1925.

1,667,035. INSULATING TUBE; P. A. Hünermann, Berlin-Weissensee, Germany. App. filed Sept. 28, 1926.

1,667,037. ELECTRIC-CIRCUIT CLOSER; E. M. Kyle and E. F. Hurley, Lakeport, N. H. App. filed Dec. 1, 1924. For automatically closing a firm-alarm circuit.

1,667,056. MERCURY-CONTACT SWITCH; I. E. Smith, Stockton, Calif. App. filed May 4, 1927.

1,667,070. ARMATURE-WINDING MACHINE; R. G. Jones, London, England, and C. Zwiebel, Dayton, Ohio. App. filed Jan. 23, 1925.

1,667,087. SYSTEM OF ELECTRICAL TRANSMISSION AND TRANSFORMATION; P. H. Thomas, Upper Montclair, N. J. App. filed Aug. 7, 1925.

1,667,142. THERMOCOUPLE; W. A. Darrah, Chicago, Ill. App. filed Feb. 24, 1925.

1,667,158. ELECTRIC SWITCH; C. E. Ives, Chicago, Ill. App. filed April 28, 1924. Hand operated switch embodied in a pistol grip or handle.

1,667,174. OSCILLATING SIGNAL; R. R. Thompson, Los Angeles, Calif. App. filed Nov. 22, 1919. Railway signal.

1,667,178. ELECTRICAL WELDING APPARATUS; I. J. Van Huffel, Warren, Ohio. App. filed April 14, 1926.

1,667,242. ELECTRIC CONVERTING APPARATUS; J. E. Calverley, Preston, and W. E. Highfield, London, England. App. filed Nov. 12, 1925.

1,667,244. ELECTRIC-WELDING APPARATUS; A. Churchward, New York, N. Y. App. filed Nov. 8, 1926.

1,667,247. ELECTRIC SWITCH; J. J. Egan, Boston, Mass. App. filed March 25, 1926. For automatically cutting out an electrically heated flat-iron when the iron is turned upon its heel.

1,667,250. ELECTRIC SOLDERING IRON; W. Ensdorf, New York, N. Y., and J. Sandberg, Elizabeth, N. J. App. filed March 23, 1927.

1,667,257. ELECTRIC HEATER; W. W. Hicks, San Francisco, and A. J. Kercher, Berkeley, Calif. App. filed Nov. 27, 1926. Adapted to prove a large area of contact between it and the medium to be heated.

1,667,293. ELECTRIC SWITCH; J. R. Marshall, McKean, Pa. App. filed June 5, 1925. Out-door switch.

1,667,297. TRAIN-LINE COUPLER; H. E. Van Dorn, Chicago, Ill. App. filed May 9, 1921. For connecting together the electrical circuits on two adjacent railway cars.

1,667,308. SILENT SECONDARY CLOCK; T. S. Casner, Plainfield, N. J. App. filed May 29, 1926. Electro-magnetically operated clock.

1,667,317. DRY CELL; G. W. Heise, Bayside, and H. H. Thompson, Flushing, N. Y. App. filed Nov. 18, 1922.

1,667,356. TIME-CONTROLLED APPARATUS; C. M. Peacock, Oak Park, Ill. App. filed Aug. 29, 1925.

1,667,410. SPEED-RESPONSIVE SYSTEM; C. R. Beall, Swissvale, Pa. App. filed Sept. 5, 1923. Railway traffic-controlling apparatus.

1,667,418. SUBAQUEOUS SOUND-SIGNALING APPARATUS; W. Hahnemann, Kitseberg, near Kiel, and A. du Bois-Reymond, Plon, near Kiel, Germany. App. filed Feb. 4, 1921.

1,667,422. DEMAGNETIZER; Toledo, Ohio. App. filed Nov. 13, 1920.

1,667,435. LEAD ACCUMULATOR; R. Oppenheim, Levallois-Perret, France. App. filed April 18, 1925.

1,667,451. APPARATUS FOR THE TREATMENT OF ORGANISMS WITH ELECTRICAL CURRENTS; W. T. Arnberg, Liljeholmen, Sweden. App. filed June 28, 1926.

1,667,452. FISHPLATE BOND; G. Barnes, Princeton, Ind. App. filed June 17, 1926.

1,667,469. LIGHT SIGNAL; P. E. Carter, Bronxville, N. Y. App. filed Nov. 9, 1921. Color light signals for railway signaling purposes.

1,667,485. CONNECTER; R. R. MacDonald, New York, N. Y. App. filed Aug. 25, 1927. For insulated stranded copper conductor cables.

1,667,487. BUTT WELDING; T. E. Murray, Jr., Brooklyn, N. Y. App. filed July 21, 1926.

1,667,510. ELECTRIC CONDUCTOR; J. R. Coe, Watertown, N. Y. App. filed July 30, 1924. A cable constituting an electrical conductor for high tension transmission lines having, in combination, a core comprising a plurality of short rigid members arranged end to end, and contacting wires of high electrical conductivity arranged spirally and side by side about the rigid members.

1,667,514. SYNCHRONOUS MOTOR; V. A. Fynn, St. Louis, Mo. App. filed Nov. 26, 1923. Possessing mechanical features of induction motors and capable of carrying variable load at synchronous speed.

1,667,515. PLATING APPARATUS; F. P. Green, St. Louis, Mo. App. filed March 28, 1927.

1,667,521. COMBINED GAS AND ELECTRIC COOK STOVE OR RANGE; F. C. Alber, Cleveland, Ohio. App. filed Nov. 26, 1924.

1,667,540. METHOD AND APPARATUS FOR MEASURING DISTANCE; H. G. Dorsey, Gloucester, Mass. App. filed Dec. 22, 1923.

1,667,555. PARKWAY-CABLE TERMINAL; W. H. B. Lavarack, Pinebush, N. Y., and D. W. Richards, Roanoke, Va. App filed Sept. 28, 1926.

1,667,581. BATTERY-TERMINAL CLIP; E. M. Bailey, Woodsdale, N. C. App. filed March 5, 1926.

1,667,585. AUTOMATIC ARC WELDING; V. J. Chapman, Schenectady, N. Y. App. filed May 22, 1926. With means for oscillating the source of heat across the work.

1,667,586, 1,667,587. APPARATUS FOR FUSION WELDING; V. J. Chapman, Schenectady, N. Y. Apps. filed Aug. 2 and 30, 1926.

1,667,595. TEMPERATURE-CONTROL MEANS; S. Halle, Colorado Springs, Colo. App. filed April 5, 1921.

1,667,612. FLOW METER AND THE LIKE; L. W. Thompson, Schenectady, N. Y. App. filed Sept. 22, 1922.

1,667,617. TERMINAL BLOCK FOR CURRENT TRANSFORMERS; E. J. Zelt, Fort Wayne, Ind. App. filed Aug. 29, 1927.

1,667,624. ELECTRICAL MEASURING INSTRUMENT; A. J. Corson and S. C. Hoare, Lynn, Mass. App. filed Oct. 17, 1924. With a temperature compensating arrangement.

1,667,633. POWER SYSTEM; C. MacMillan, Schenectady, N. Y. App. filed July 26, 1923. As applied to driving a ship.

1,667,636. CABLE GRIP; A. H. Nero, New Britain, Conn. App. filed June 8, 1923. Pendent fitting.

New Trade Literature

MOTOR MAINTENANCE EQUIPMENT.—The Martindale Electric Company, 1260 West Fourth Street, Cleveland, has issued catalog No. 10, covering its motor maintenance equipment. This catalog contains twelve new products since the issue of previous catalogs and also mentions five improved products.

RECORDING LIQUID LEVEL GAGES.—Catalog No. 1800, issued by the Bristol Company, Waterbury, Conn., covers the Bristol recording liquid level gages. The various types are described and illustrated. Reproductions of the different types of charts employed are included. It contains a few methods of installing and attention is called to the electric motor-operated clock furnished with Bristol's recorders.

AIR COMPRESSORS AND TRANSFORMERS.—The General Electric Company, Schenectady, N. Y., is distributing bulletin GEA-233B, describing its single-stage centrifugal air compressors. It contains an illustration giving the construction details as well as a curve showing the operating characteristics. The company also has issued bulletin GEA-912, covering its type YU-1140 transformers for oil burners for both ignition and control.

ELECTRIC APPLIANCES. — Landers, Frary & Clark, New Britain, Conn., are distributing a new catalog covering "Universal" electrical household appliances, table appliances, table stoves, heating devices, curling irons, heating pads, etc.

AUTOMATIC CONTROL.—"Speeding Up Production with Automatic Control" is the title of bulletin No. 110 issued by the Monitor Controller Company, Baltimore, Md., in which it covers the importance of automatic control. It also contains illustrations showing the application of automatic control to machine tools, also some specific applications of Monitor control and Monitor master stations.

SWITCHBOARD DEVICES AND RECORDING INSTRUMENTS.—The General Electric Company, Schenectady, N. Y., has issued bulletin GEA-940 and GEA-584A, covering its switchboard devices, such as panel and benchboard pipe fittings, and its totalizing recording instruments and remote indicators.

Foreign Trade Opportunities

Following are listed opportunities to enter foreign markets. Where the item is numbered, further information can be obtained from the Bureau of Foreign and Domestic Commerce, Washington, by mentioning the number:

An agency is desired in Berlin, Germany (No. 30,961), for cloth cutters and sewing machine motors.

An agency is desired in Medan, Sumatra (No. 31,010), for flash-light cases and batteries.

Purchase is desired in Dresden, Germany (No. 30,956), of electric heating appliances and ventilators.

An agency is desired in Santo Domingo, Dominican Republic (No. 30,947), for household electrical appliances and wiring supplies.

An agency is desired in Montevideo, Uruguay (No. 30,970), for household electrical appliances, wiring supplies, shades, globes, ranges, etc.

Purchase is desired in Copenhagen, Denmark (No. 31,005), of insulating material, ebonite parts, and signal boxes.

An agency is desired in Stockholm, Sweden (No. 31,009), for electric machinery and instruments and X-ray equipment.

Purchase and agency are desired in Sydney, Australia (No. 31,006), for fractional horsepower motors.

Copies of specifications for a 50 kilovolt switchgear and steelwork required for the Arapuni Scheme in New Zealand have been received from trade commissioner Julian B. Foster, Wellington. A copy of this specification is available in the Chicago district office and also in Washington. The closing date for tenders is July 10, 1928.